ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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What in the World!

The cheerful reaction of the public to the bank crisis was the one confidence-building element of the situation. We will have more crises, but we shall survive and go forward.

●

Here comes the electrochemical industry with promises of new developments that, of themselves, will bring prosperity. We were interested, cheered and inspired by Dr. Fink.

●

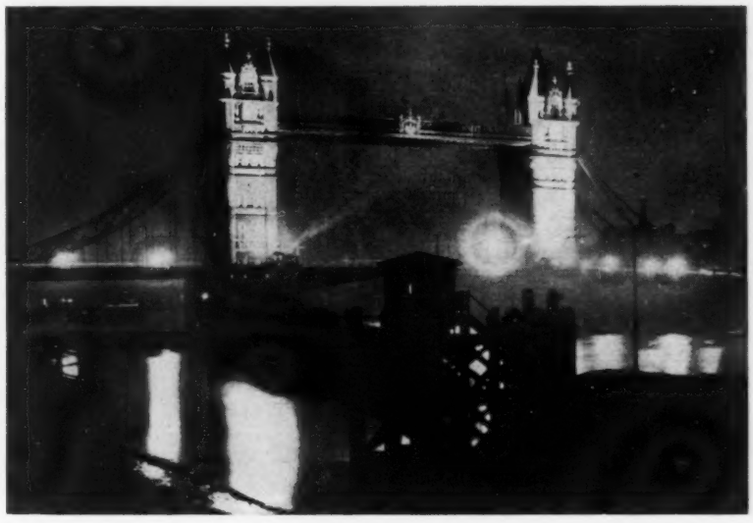
We think the college theses might well be used for many current industry problems such as rural service. Mr. Nichols has done a fine job of compilation and analysis and the industry can make logical deductions for improving conditions.

●

We do not believe rates should be allocated on an investment cost basis, but we do believe investment costs in distribution should be known so that engineers and managers can improve distribution and reduce costs. The data of Mr. Pike in this issue and his development of a method to get costs should create interest in cost analysis. Many will differ with Mr. Pike and no generalizations should be made, but his study shows that more studies would be valuable.

●

We are busy developing actual studies on marketing and on present conditions in the several industry groups. These studies should aid the industry to go forward based upon present facts and conditions.



Tower Bridge (London) floodlighted

MARCH 18, 1933

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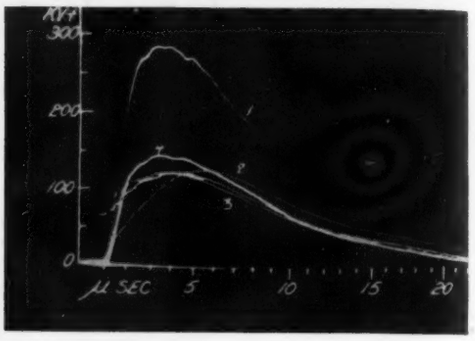
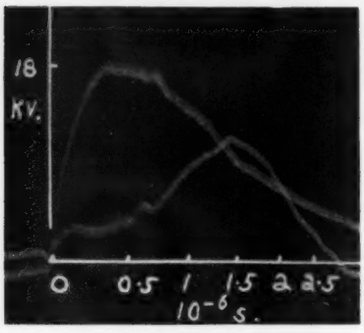
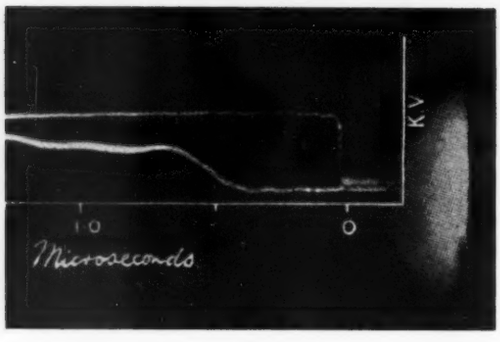
UNITED STATES



ENGLAND



GERMANY



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ELECTRICAL WORLD

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March 18, 1933

California Utilities Little Damaged by Severe Earthquake

SUFFERING to varying degrees from the earthquake which rocked southern California late last week the utilities of that state are supplying service after a certain inevitable interval of interruptions. Surveys of the damage done to utility properties have yet to be completed, but preliminary reports show relatively little damage in the electrical field. Estimated total damage to California property is $45,000,000, of which $25,000,000 occurred at Long Beach. At least 116 persons lost their lives as walls crumbled and they were buried in the débris.

Southern California Edison Company reports its $37,250,000 Long Beach steam station to be virtually undamaged and service to have been uninterrupted. Minor damages were reported to equipment at the Long Beach and Compton substations. Service to Long Beach and adjacent communities was restored after some interruptions.

Los Angeles Gas & Electric Corporation, because of the breakage of oil lines furnishing fuel to its Seal Beach station, was compelled to shut down that plant. Service was restored through connection with the Southern Sierras Power Company. At Seal Beach several large transformers were overturned and one generator is unofficially reported damaged.

Pacific Lighting Corporation gas service suffered some damage, but its 26-inch line from the Kettleman Hills to Long Beach was undamaged. Gas is said to be the only utility not functioning in Long Beach at the beginning of this week.

Communication companies report wrecked exchanges and buildings at Compton and Long Beach which will require rebuilding. Southern California Telephone Company found its $1,000,000 underground system in Long Beach undamaged. Los Angeles Bureau of Power & Light reports but slight damages.

Southern California Edison Company is co-operating with the Red Cross and hospitals to supply electric ranges, air heaters and heating pads where needed.

▼

California Senate Votes Probe; Commission Favors Taxes

Protesting that the California Railroad Commission regards it as more feasible for the state to reduce the return of utilities by raising the gross revenue receipts tax than to secure rate reductions, Clyde L. Seavey, president of the commission, has nevertheless accepted the orders of the California Senate demanding an investigation of utility rates.

"If it is your desire," states Mr. Seavey's letter to the Senate, "that we proceed at once to attempt drastic reduction of rates under present circumstances, we are prepared to do so. . . . The commission is in a much better position to prevent rate increases than to reduce rates."

The Railroad Commission has reported virtually all utilities of the state as earning below the commission's estimate of reasonable return on the commission's valuation (ELECTRICAL WORLD, December 3, 1932, page 740). Recent reports show major companies only a little more than earned common dividends in 1932.

▼

Gross Income Tax in South Dakota

Passage of a bill levying a state tax of 12½ per cent upon the gross income of all utilities is reported as one action of the present legislative bodies of South Dakota. Enactment of a sales tax on all commercial transactions and an increase in the state income tax was also effected.

▼

"Daily Demand" Rate Clause Aids Part-Time Industrials

Appreciating the fact that this is a time of stress for many of its industrial customers Public Service Company of Northern Illinois, to meet present conditions, has instituted a "daily demand" rider, to be effective until the end of 1933, and to be attached to the existing power contract.

By the terms of this rider, the customer pays $0.15 per day per kilowatt for the first 200 kw. of demand instead of the $2.30 per kilowatt per month in the regular contract, with a minimum charge of $60 per month (based on 25 kw. per day for sixteen days). Demands above 200 kw. earn reduced charges as is customary.

Under this new arrangement the monthly bill is itemized to show the demand established for each day. These daily items are totaled in their several steps and multiplied by the daily charges. The energy rates in the existing contract are not modified by the rider and this portion of the bill is calculated in the usual manner.

The rider is terminable immediately upon notice by the customer, but no customer may avail himself of the rider if terminated without having been continuously in force for 90 days until after the expiration of 90 days after such termination.

Another provision is that the customer agrees that his maximum demand in kilowatts during the peak service period shall not exceed 15 per cent of either of the highest monthly maximum demands established in the twelve months preceding the furnishing of service under the rider, or the average of the highest sixteen daily off-peak maximum demands established under

the rider, whichever shall be the higher.

A plant operating at production less than sixteen days per month can generally save money by the daily demand rider. If production is for more than sixteen days the existing monthly demand basis is usually more desirable.

▼

Middle West Creditors Win Collateral Rights

Three Chicago banks and one brokerage house holding utility stocks pledged with them by the Middle West Utilities Company, in alleged violation of the federal bankruptcy act, must reach a settlement with Middle West creditors over possession of the stock within twenty days or face a bankruptcy hearing that will disclose how the collateral was obtained. So ruled Federal Judge James H. Wilkerson at a hearing this week on a petition brought by counsel for the Middle West preferred- and common-stock holders seeking to delay further the opening of the bankruptcy hearing which the judge had previously ordered begun. Judge Wilkerson granted the stockholders' counsel to April 3 to prepare themselves for cross-examination of the various Middle West officials to be subpoenaed.

Shifts in the personnel of the directorates of various Insull subsidiaries continued during the past week. Stanley Field, Chicago banker, has resigned as a member of the boards of the Commonwealth Edison Company and the Public Service Company of Northern Illinois on the grounds that he does not think it advisable to retain the posts while under indictment by the federal grand jury, with other officers and directors of the Corporation Securities Company. Morse Dell Plain has been elected a director of Midland United Company to succeed Britton I. Budd. At a recent meeting of the stockholders David B. Pierson, John F. Egolf and John Alexander, all of Aurora, Ill., were elected directors of the Western United Corporation and its subsidiary, the Western United Gas & Electric Company, succeeding Samuel Insull, Sr., Martin Insull and Samuel Insull, Jr.

Dividends dropped

Several companies in what was formerly the Insull system deferred actions on dividends due to local bank holidays and the national moratorium. Directors of the Wisconsin Power & Light Company have rescinded their recent declaration of dividends on the preferred stocks payable March 15. At the annual meeting of the stockholders of this company amendment to articles of incorporation was adopted reducing the par value of the common stock to $50 from $100 per share. A substantial part of the capital surplus of $7,309,250 thus created will be used to write off property abandonments and for other balance sheet adjustments. Dividends on preferred stock of the Lexington Utilities Company, payable March 15, have been rescinded and action on the quarterly dividends on the 6 per cent preferred and $6 preferred stocks of the Central Illinois Public Service System was deferred.

Midland United reports

Annual report of the Midland United Company for 1932 shows a consolidated deficit of $1,926,454 after charges, underlying dividends, depreciation and taxes, contrasting with a net income of $2,834,933 in 1931. Gross earnings last year were $38,302,097, against $46,018,323 the year before, and net earnings were $10,724,773, against $16,433,674. The company and subsidiaries reduced their loans from banks from $6,105,500 as of December 31, 1931, in the amount of $1,162,638 during the year, leaving a balance of $4,942,862 owed at the close of 1932. Due principally to the unusually large amount of maturing obligations it was necessary during the year to borrow from affiliated interests $3,407,737 in addition to similar obligations totaling $4,396,793 owed at the close of 1931.

Total charges and write-offs of $27,444,431 were made at the close of the year to cover capital losses of Midland Utilities Company, a subsidiary, miscellaneous investments, loss on securities loaned to affiliated interests and losses arising from syndicate participations and sales of property and securities, and to set up reserves for deficits subsequent to acquisition of those subsidiaries which have accumulated deficits since acquisition dates, and reserve to cover notes receivable of a subsidiary investment company.

Ohio Electric Power changes

Coincident with the election of M. L. Sindeband, formerly vice-president of American Gas & Electric Company, to the vice-presidency and membership of the board of directors of the Ohio Electric Power Company operating costs are reported to have been cut sharply and methods altered. Mr. Sindeband has also been named receiver for the Columbus, Delaware & Marion Electric Company and vice-president of Reserve Power & Light Company. All these companies are members of the Middle West system through National Public Service.

▼

Montreal Buys Street Lamps

Montreal is to pay $900,000 to Montreal Light, Heat & Power Consolidated for the old-fashioned arclight street lamps originally put in by the public utility company and now being rapidly replaced by city-owned "white light" lamps. The money is to be raised by a loan.

Pinchot and King Break; Commission Control at Stake

As an outgrowth of the Pennsylvania Senate investigation of public utilities the long-standing political friendship of Governor Pinchot and Dr. Clyde L. King, chairman of the State Public Service Commission, was broken last week. Declaring that Dr. King had created the widespread impression that he was against continuing the investigation and was for shielding the utilities, thereby putting himself squarely on the side of the public utilities and against the people, Governor Pinchot said: "Dr. King's usefulness as chairman is at an end. If I could withdraw his nomination from the Senate or command his resignation, I would."

To these charges Dr. King replied at length, refusing to resign. "He (the Governor) means that my usefulness to him for his own personal political advantage is at an end," he said. "He demands that I make a political shambles of this commission for his personal political advantage. He insisted that I do the muckraking and misrepresent the facts. He denies to others the square deal he has paraded when it is not to his own advantage. Such hypocrisy as this must speak for itself."

The Governor and Dr. King quarreled over the testimony the latter gave before the Senate committee. Governor Pinchot's tirades against public utilities have been among his principal political issues. Dr. King has testified before the committee that he did not know of any wrongdoing by members of the commission or by utilities (ELECTRICAL WORLD, March 4, page 276).

Pinchot promises to fight

In commenting on Dr. King's testimony, Governor Pinchot said in part: "I have never attempted to influence or control Dr. King or any other member of the commission upon any question before the commission. But this is a matter of state-wide policy of the gravest importance. I cannot let personal considerations interfere with the public interest. When I appointed Dr. King I was entirely confident he would stand like a rock for the people. He was then emphatically in favor of pushing the investigation to the end. I am profoundly grieved and completely puzzled by his deplorable change of front. The full story of public utility corruption has not been told, and the people have the right to know the facts. I will use every power I have to see that the facts are given to the people."

Dr. King's name is now before the Senate for confirmation or rejection, and reports indicate that Governor Pinchot is facing a fight for control of the commission, although he has appointed five

of the seven members of the body. As the situation stands at present three members of the commission have declared for the Governor's policies and four members have not formally put themselves on record.

Eaton resignation accepted

Another development of the week was the acceptance by the investigating committee of the resignation of Oliver K. Eaton, Pittsburgh, as chief counsel, and J. J. Levy and J. C. Ganey, associate counsel, who charged the inquiry was not being carried on thoroughly (ELECTRICAL WORLD, March 11, page 305). Franklin S. Edmonds has been appointed chief counsel to succeed Mr. Eaton, to the approval of the Pinchot faction.

In the meantime the Dauphin County Court issued a rule to show cause why the answers filed by Mr. Eaton to the injunction proceedings now pending against the committee in the local court should not be stricken off the record. George R. Hull, who filed the motions, charged that the answers were filed in the name of the substituted members of the Senate committee before their substitution was allowed in the record by the court. The court had earlier issued a rule to show cause why the new members should not be substituted for the old. Technically, Mr. Hull contends, the new members are not defendants until their right to be substituted in the case is disposed of by court. While the petitions to strike off the answers do not indicate the possibility of eliminating the cases from the record, they will tend substantially to prolong their disposition.

▼

San Francisco Inspector Hits Home-Owner Wiring

Definitely black-balling one product, but basing his restrictions upon the alleged hazards of work by inexperienced installers, Ralph W. Wiley, chief Department of Electricity, San Francisco, Calif., has withdrawn permission for the installation and sale of "Electrotrim" in the city and county of San Francisco.

"If it were possible for this material to be installed by registered electrical contractors only, in accordance with the installation restrictions laid down and approved by the National Board of Fire Underwriters, there would be no objection to its use in this city," was the official declaration of Mr. Wiley.

His declaration went on to state that "when the material is sold to the public, the installation restrictions which govern its approval by the laboratories become void and the use of the material then exceeds the purpose for which it was manufactured and passed by the laboratories, and may create an electrical hazard."

Of Course, One Swallow Does Not Make a Summer

America's overwhelmingly confident response to the exigencies of the banking moratorium and its equally inspiring acceptance of the soundness of the solution involved could have been no better demonstrated than by the immediate reversal of the flow of gold and currency but a few days previously headed for hiding behind the loose brick in the fireplace. Mr. Roosevelt, surprising his friends and perhaps himself, happily combined fortuitous circumstance and his willingness to fight hard and quickly for principles of ultra-conservativeness and fundamental acceptance and turned a rout into an advance.

Inflation, guaranteed bank deposits and all the unwholesome crew of evasive expedients have been scrapped, at least temporarily, for one glorious attempt to face facts courageously. That same spirit by the leader and that same acceptance by the public of solutions for the problems of balanced budgets, railroad receiverships, farm mortgage difficulties, veteran rackets and wild relief proposals will go far toward the winning of the battle.

Seldom if ever has a President so captured the imagination and confidence of the people as has Mr. Roosevelt. He has in swift, strategic strokes obtained from Congress powers which another wore his heart out seeking. He has an opportunity such as is virtually unheard of. To our intellectuals' desperate seekings for a dictator he offers an approximation of that very thing.

It is only necessary that he be right; that his plans and expediencies yield the measure of results that we all seek. America stands at a point of psychological vantage today where failure is unthinkable in terms of the broad view of the whole public welfare. Don't be surprised to be further surprised in March.

Exclusive Territories Assigned to Manufacturers by Utility

Effective March 1, Pacific Gas & Electric Company instituted a new policy of assigning definite territories to certain makes of appliances for exclusive utility effort. Under the new plan appliances will be allotted territories or certain divisions will be allotted certain manufacturers; in these territories, company salesmen will sell no other make of that appliance, but will concentrate on the one, learn it thoroughly and sell it more effectively.

According to Hugh Crawford, general sales manager for Pacific Gas & Electric, this plan should reduce selling costs of manufacturers and distributors by enabling them to concentrate their promotion efforts and permitting them to devote effort to develop dealer outlets in territories where the utility does not sell the particular appliance.

Advertising plans of the company, which include much space of a general nature, will not be affected materially, and electric cookery will be sold in preference to any make of range.

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Jamestown, N. Y., Backed by Board

Formally dismissing the complaint of the Niagara, Lockport & Ontario Power Company against the city of Jamestown as to prices charged the public for electricity, the New York Public Service Commission has closed its records on the case. The proceeding was started some time ago (ELECTRICAL WORLD, January 14, page 50) as the result of a complaint filed by the company alleging that the city of Jamestown was selling electricity from its municipal plant at less than cost. Subsequently, the property of the company in the city was sold to the city and made a part of the municipal operation. The commission, however, continued its investigation, which showed that electricity was not being sold at less than cost by the city.

▼

Liversidge Sees Opportunity for Co-operative Marketing

"There has never been a time in the history of our industry when there was a more favorable opportunity to undertake co-operative merchandising than at present," Horace P. Liversidge, vice-president Philadelphia Electric Company, told the New York Electrical Association this week. "The stage is set for what might readily prove the most spectacular record of accomplishment that the business world has ever seen." Mr. Liversidge, winner of the McGraw award for all-industry co-operation in recognition of his successful efforts to develop electrical markets for the benefit of all parties concerned and largely upon what he has frankly conceded to be his own organization's enlightened self-interest, offered the local situation as the fundamental key to any wide development of electrical markets.

With a three-part program for the possible immediate improvement of markets and the co-ordination of efforts of all interests he suggested the formation of (1) a national co-ordinating council to be composed of the representatives of the four major electrical trade associations, N.E.M.A., E.E.I., N.E.C.A. and N.E.W.A., (2) a national bureau for sponsoring national, sectional and local efforts, and, (3) local bodies to carry out the program and policies so established.

In the future, Mr. Liversidge pointed out, our distribution machine must be made efficient, sound and economical if the ideal of increased distribution of products at reasonable prices with fair profit margins is to be met.

Coming Meetings

National Sales Section, N.E.L.A.—Committee meetings, Chicago, March 21-23. B. F. Weadock, 420 Lexington Ave., New York.

National Engineering Section, N.E.L.A.—Committee meeting, Detroit, Mich., April 3-7. B. F. Weadock, 420 Lexington Ave., New York.

Maryland Utilities Association—Baltimore, Md., April 21. D. E. Kinnear, 803 Court Square Bldg., Baltimore, Md.

Missouri Association of Public Utilities—St. Louis, Mo., April 27-28. N. R. Beagle, 101 West High Street, Jefferson City, Mo.

American Institute of Electrical Engineers—District meeting, Schenectady, N. Y., May 10-12. H. H. Henline, 33 West 39th St., New York.

Electrochemical Society—Montreal, Que., May 11-13. Colin G. Fink, Columbia University, New York.

National Fire Protection Association—Milwaukee, Wis., May 29-June 1. A. R. Small, 109 Leonard St., New York.

Edison Electric Institute—Chicago, Ill., June 5-8. B. F. Weadock, 420 Lexington Ave., New York.

▼

New Indiana Law Revises Many Regulatory Bases

By signing the bill revamping the Spencer-Shively utility law Gov. Paul V. McNutt of Indiana has opened the way for the new Indiana Public Service Commission to reduce utility rates unhampered by such intangibles as "going value" and "natural rights." The new measure defines the rate base and eliminates the intangible values. It also provides for appeals to the state courts with the intent of eliminating federal court appeals which have been taken by many utilities when adverse decisions were rendered.

The measure lays down new rules for municipal ownership and permits municipal plants to withdraw from public service commission jurisdiction over rates upon a referendum vote. Right of eminent domain is given cities to purchase plants, but the new law forbids bonding the city to go into the utility business. The bonds must be issued on the utility property. This feature and the requirement that municipal plants must pay county and state taxes were objected to by mayors in cities in which municipal plants now are located, but the administration leaders insisted on taxing the municipal plants.

▼

Bone Power Bill a Law

With the signature of Gov. Clarence D. Martin of Washington affixed last week, the famous "Bone" bill, recently revived, has become a law. Under its provisions municipalities are permitted to sell power to districts beyond their corporate limits. The original bill was introduced when Senator Bone was a Farmer-Labor party member of the House in 1923, but at that session he was prevented from speaking on his own bill by a "gag" rule. At the last fight more than three hours was spent in parliamentary battle for delay on the bill. As passed, the bill contained an amendment, proposed by Mr. Bone, requiring that the district in which the municipal lines were to be extended shall express its approval of such extension.

▼

Rocky Mountain Division of N.E.L.A. Reorganizes

Electric light and power companies of Colorado, New Mexico and Wyoming have formed the Rocky Mountain Electrical Association, to supplant the late Rocky Mountain Division of the National Electric Light Association.

Four major committees will handle the work of the association. These will be engineering, business development, accounting and general. The respective committee chairmen will be: A. H. Heitzler, Public Service Company of Colorado; H. L. Pinkerton, Albuquerque Gas & Electric Company; H. A. Mitchell, Public Service Company of Colorado, and W. D. Johnston, Mountain States Power Company.

Officers are: President, Fred Norcross, Home Gas & Electric Company; vice-presidents, J. J. Withrow, Sheridan County Electric Company; G. B. Buck, Public Service Company of Colorado, and K. W. Kissick, Deming Ice & Electric Company; treasurer, A. C. Cornell, Graybar Electric Company, and secretary, George E. Lewis, Gas & Electric Building, Denver.

▼

Competitive Power Problems Before Oklahoma Association

Not a monopoly, but an industry faced with no less than five forms of exceedingly active competition, was the contention of W. H. Steuve, Oklahoma Gas & Electric Company, in discussing the utility's position in the power market before the fifteenth annual convention of the Oklahoma Utilities Association in Oklahoma City last week. Mr. Steuve saw a constant battle going on between the use of purchased power and other forms of energy production, in which the constant vigilance of the power salesman is necessary to retain present or to secure new business.

J. A. Whitlow, vice-president Public Service Company of Oklahoma, discussing municipal ownership problems and relationships as they affect the utilities, brought out the disadvantages to taxpayers generally outside of the municipalities operating utilities in having to make up for the failure of municipal plants to bear their part of school, county and state taxes.

Citations of the value of electric light and heat and of the effect upon plant growth were offered by Roy Hayman of Oklahoma City. He showed specific instances and applications where economical results of a highly satisfactory nature had been obtained in soil heating, sterilization and plant propagation. It was pointed out that such uses of energy can be supplied without material investment by the power company beyond the increasing of transformer equipment and at an extremely low cost to the greenhouse operator for equipment.

R. J. Benzel, vice-president Southwestern Bell Telephone Company, was elected president. H. B. Cobban, general manager Northeast Oklahoma Railroad Company, was elected first vice-president and C. O. Dunten, president Oklahoma Power & Water Company, second vice-president. The electric division of the association chose John T. Naylon, district manager Oklahoma Gas & Electric Company, El Reno, as division chairman.

▼

Lilienthal Wants Legislation; Public Welfare Comes First

Holding that Illinois, as the center of the Insull organization, owes a definite obligation to the nation for leadership toward constructive regulatory action, David E. Lilienthal of the Wisconsin Public Service Commission offered some suggestions at a public meeting this week in Chicago. It was Mr. Lilienthal's contention that four legislative steps should be taken:

1. A broad grant to the state commerce commission of jurisdiction over all transactions between any operating utility company and any affiliated company or interest, including not only holding companies but any other companies having common directors.

2. That utilities be prohibited from lending funds to related companies, except under strict commission control.

3. That the state commission require, except in unusual cases, competitive bidding by investment bankers or senior securities issued by a public utility, so that the utility will receive the highest possible price for the protection of the rate payer.

4. That public utilities be forbidden to pay dividends on common stock at the expense of adequate provision for depreciation and other reserves, or where such dividends endanger the capital structure.

"Business and government must demonstrate to a skeptical public," said Mr. Lilienthal, "that in the future they will function for the general public welfare. Confidence of consumers and investors in the utilities can be regained only by a return to the fundamental that public utilities are public businesses."

Security Markets Resume After Nine-Day Shut-Down

Trading in the securities of foreign and domestic corporations was resumed without restriction on the New York Stock Exchange on Wednesday of this week following the holiday, which had lasted since March 4. Exchanges in other cities opened subsequently.

ELECTRICAL WORLD's index of utility stock prices, omitted this week, will be continued in later issues.

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Massachusetts Companies Oppose New Legislation

Representatives of leading utilities in New England opposed the regulation of holding companies before the committee on power and light of the Massachusetts Legislature on Monday of this week at Boston, asserting that existing laws provide ample protection for the consumer through the regulation by the Department of Public Utilities of operating company rates, service and capitalization. Eleven measures were before the committee. B. Loring Young, for the New England Power Association, pointed out that the system generates electricity in four states and distributes it in five. Under present laws the ownership and management of these properties could not be vested in one company.

In rebuttal to charges that holding company ownership tends to prevent rate reductions, Mr. Young said that last year the subsidiaries of this association filed 237 rate reductions affecting 34 companies and saving consumers $633,000. The management has never appealed a rate decision to the courts. The argument that rates are too high because they have declined less rapidly than commodity prices is unsound, he contended, because they declined steadily from 1913 to 1929 and are now lower than the average index price of all commodities.

W. Rodman Peabody, vice-president Western Massachusetts Companies, pointed out that this trust was formed in the Connecticut Valley to maintain local control of about a dozen independent but interconnected properties which were in danger of falling into outside hands. An intrastate holding company was organized rather than a single operating company for three reasons: (1) Earnings plowed into plant were not adequately expressed in capitalization; (2) rate regulation is simpler for the state when dealing with smaller area units; (3) local directors safeguard subsidiary rights and local service better than a board removed from neighborhood contacts. Twelve per cent has been cut from the gross expenses of the properties and $4,000,000 saved to the public in rate reductions since the group was unified.

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Kansas City Power & Light Issues 1932 Report

(Year Ended December 31.)

Earnings		
Gross earnings	$14,664,001	1.3% above 1931
Net earnings	$5,673,787	—0.7% below 1931
Operating ratio	61, same as in 1931	
Depreciation allowance	$2,103,707	14.3% of gross earnings 2.7% of plant investment
Times prior charges earned	3.3	in 1931, 4.5
Net balance per share of common	$7.05	in 1931, $8.15
Dividends declared on common	$6.00	in 1931, $7.00
Output		
Energy output, kw.-hr. (approximate)	625,000,000	Compared with 1931, per Cent
Balance Sheet		
Total assets	$87,824,482	+ 6.5
Funded debt	$41,250,000	+14.5
Capitalization	$69,645,000	+ 8.2
Total surpluses plus reserves	$15,459,491	— 0.9
Ratio of current assets to current liabilities	6.3	in 1931, 4.6

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American Water Works Issues 1932 Report

Year Ended December 31 (Consolidated Statement)

		Compared with 1931, per Cent
Income		
Gross earnings	$43,671,609	—12.6
Operating expenses, maintenance, taxes, interest, amortization (subsidiaries), preferred dividends of subsidiaries, etc.	35,937,865	— 8.1
Depreciation	2,746,651	—11.2
Balance for preferred and common dividends of American Water Works & Electric	3,691,620	—42.3
Charge to surplus to pay dividends	$972,842	$346,360
Balance Sheet		
Plant and property	$389,211,422	Negl. change
Current assets	11,733,997	— 6.1
Current liabilities	6,084,983	—14.1
Funded debt	184,362,600	0.8

Write-down of securities to meet market value as of December 31, 1932, $908,300 and write-off of securities $1,137,094 charged to surplus.

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Further Investigation of Utilities Approved

A joint resolution to continue the investigation which has been under way in the House into certain public utility holding companies was adopted by the Senate last week and signed by the President. The resolution specifically authorized members of the House committee on interstate and foreign commerce who are members-elect to the 73d Congress to continue the investigation after the expiration of the 72d Congress until the organization of the committee on interstate and foreign commerce for the 73d Congress.

The original resolution under which the inquiry was begun authorizes investigation of "the ownership and control . . . of stock, securities or capital interests in any public utility corporation engaged otherwise than as a public carrier by railroad in the transportation, transmission, or sale of property, energy, or intelligence, in interstate or foreign commerce, by holding companies, investment trusts, individuals, partnerships, corporations, associations and trusts, and the organization, management and control, etc., of such holding companies."

Later, the Senate inserted in the second deficiency appropriation bill an appropriation of $50,000 to pay the expenses for the holding company investigation.

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Commission Assessor Backs Old Dominion Tax Payments

After an adjournment of 30 days (ELECTRICAL WORLD, February 4, page 150) hearings of the Virginia Coal Operators' Association's petition for power rate reductions were continued last week before the Virginia Corporation Commission, when R. E. Steele, assessor to the commission, told that body that although the Old Dominion Power Company's tax reports in the years 1930, 1931 and 1932 have been far beneath the reported book value of the company's properties, tax assessments in those years have been made properly and the localities have received proper taxes.

In the course of the proceedings counsel for the coal operators has charged that the power company, on December 31, 1931, reported a book value of the properties at $5,259,168, and on January 1, 1932, reported a tax value of only $904,409. Called as a witness by the commission itself, Mr. Steele testified that in 1930 the company reported $781,746 in taxable values and that the commission found a fair market value in that year of $1,917,370 for those properties and fixed the assessed value at $575,211, or 30 per cent of the fair market value. In 1931 the company's tax report showed property values to the extent of $820,253. Again the commission fixed the fair value at $1,935,555 and the assessed value at $580,666. In 1932 the company returned its taxable values at $904,470.

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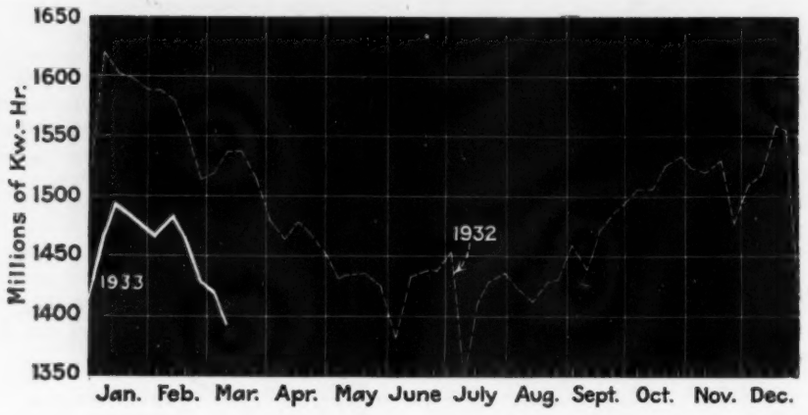
High-Tension Conference

Paris, France, will be the place at which the seventh session of the International Conference on Large High-Tension Undertakings will be held, June 18 to 24. There will be nine meetings, three dealing with power generation and transformer practices, three with the maintenance and insulation of transmission lines and three with distribution facilities.

Bank Holiday Slackens Industry



Prompt response to the disturbed conditions prevailing throughout the country and manifested by the proclaiming of a bank holiday, or resulting from it, probably accounts for the pronounced reduction in output of central stations for the week ended March 11. This output, as announced by the Edison Electric Institute, was 1,390,607,000 kw.-hr., a decrease of 9.6 per cent from the corresponding week of 1931, in contrast with the 6.4 per cent decrease of the preceding week, and was 2.3 per cent less than the production of the week of March 4.

The decline was particularly marked in the industrial areas. The disparity against 1932 rose to 14.4 per cent in the Central industrial area, 8.0 per cent on the Atlantic Seaboard and 10.4 per cent in New England alone. The Pacific Coast was but slightly affected.

Weekly Output, Millions of Kw.-Hr.

Week Ended	1933	1932	1931	1930
March 11	1,391	1,538	1,676	1,736
March 4	1,423	1,520	1,664	1,750
February 25	1,426	1,512	1,633	1,744
February 18	1,470	1,545	1,680	1,746
February 11	1,483	1,579	1,684	1,770

Per Cent Change from Previous Year

Region	Week Ended Mar. 11	Mar. 4	Feb. 25
Atlantic Seaboard	— 8.0	— 5.2	— 4.1
New England alone	—10.4	— 7.1	— 5.5
Central industrial	—14.4	— 9.6	— 9.4
Pacific Coast	— 5.8	— 5.3	— 5.4
United States	— 9.6	— 6.4	— 5.7

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Competition by Elevated Opposed by Boston Edison

Opposition to a legislative bill authorizing the Boston Elevated Railway to sell surplus power to transportation and other utility companies was voiced at a hearing in Boston last week by F. Manley Ives, counsel for the Edison Electric Illuminating Company. Recently the Massachusetts Department of Public Utilities recommended that the railway company consider purchasing its power from the Boston Edison system, with its important interconnections with interior hydro systems and its tidewater steam plants, but the elevated trustees have never warmed up to this proposal, probably holding that their own 25-cycle plant on Boston Harbor is sufficiently economical for its purposes.

Boston Edison retained Jackson & Moreland to study the situation, and as a result of their findings has offered to buy the elevated company's plant for $8,000,000 and to sell energy to the railway at about 8 mills per kilowatt-hour. Mr. Ives stated that it is estimated that the elevated would save about $350,000 per year by this arrangement, but that no answer had been received. H. Ware Barnum, counsel for the railway, said that the road has 20,000 kw. of surplus capacity and that the trustees of the road are studying the problem and Edison proposal. Mr. Ives contended that unfair competition would result if the bill passed on account of lack of restrictions on the procedure of the railway. The Edison stations are 60-cycle and the Elevated's 25-cycle plants, but both companies are utilizing mercury-arc rectification in certain substations.

▼

Shoals Plan Presented to Senate by Norris

Legislation to hasten the realization of President Roosevelt's plan for converting the Tennessee Valley into a highly developed industrial workshop was introduced last week in the U. S. Senate by Senator Norris of Nebraska, who attached it as a rider to his twice-vetoed measures for government operation of Muscle Shoals. A $10,000,000 appropriation would be authorized for the Muscle Shoals and Cove Creek Dam construction work, with the latter receiving $2,000,000. The portion of the Senate measure dealing with Muscle Shoals is almost identical with the bill which passed the last session of Congress and was vetoed by President Hoover.

The Norris measure, in addition to providing for manufacture and sale of power and fertilizer at Muscle Shoals and for construction of the Cove Creek Dam in Tennessee, would authorize Mr. Roosevelt to launch an immediate survey of the Tennessee Valley and to recommend to Congress legislation to achieve these aims.

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$1,225,000,000 Invested in Canada's Central Stations

Canada takes a census of her electric light and power industry each year, unlike the United States, which is content with enumerations at five-year intervals. According to a preliminary report giving statistics for 1931, recently published by the Dominion Bureau of Statistics, the total output during that year was 16,330,867,000 kw.-hr., 12,191,160,000 kw.-hr. in commercial and 4,139,707,000 kw.-hr. in municipal stations. The total is 9.7 per cent less than in 1930, the second time on record that there has been a decrease. The other was in 1921.

Revenue was $122,310,730, down 2.9 per cent, but revenue for domestic energy increased 3.2 per cent to $35,259,391 and for commercial lighting 0.2 per cent to $20,655,553. Large power sales were $56,381,609, a decrease of 9 per cent.

Capital rose to $1,229,988,951 from $1,138,200,016 in 1930; customers to 1,632,792 from 1,607,766; number of employees decreased to 17,014 from 17,857.

▼

British Railway Benefited Through Electrification

Electrification of the Southern Railway, in England, has paid even though undertaken in depression times, Gerald Loder, chairman, told stockholders last week. The company's policy of electrification, consistently pursued, has been amply justified, Mr. Loder said, adding that otherwise the railway's financial position would be much less favorable than it is. The decrease of passengers on the newly electrified Brighton line was only 1.2 per cent, against 4.5 per cent elsewhere, he said.

The electrified part of the London-Brighton line brought an increase of 13.5 per cent in traffic in the first 5½ months of 1932, and since January 1 of this year, when the remaining section was electrified, the traffic has increased further, the chairman explained.

Diesel Buyers Unprotected, Power Salesmen Decide

Even if "Payment-out-of-Savings" contracts which Diesel engine builders offer utility customers included all expenditures and afforded service equal to that now obtainable with purchased power the customer would not effect any savings until the installation cost is amortized, members of the Interstate Power Club at the meeting in New York last week generally agreed. Hence, they contend, the customer cannot reduce his out-of-pocket expenditures in the meantime, although it is immediate economies that he wants. At the end of the amortization period, said the speakers, the purchaser may be faced with an economically obsolete plant, considering the downward trend of rates. Modernization of industrial processing was offered as a move which would place the energy-buyer in a better position to meet competition.

Many out-of-pocket expenses were cited and that prospects are led to believe that maintenance expense, labor and executive supervision will be lower than will be experienced was contended also. In such event the customer does not experience the anticipated savings out of which he makes his monthly payments for amortization of investment which must be met anyway. Freight hauling, handling and building alteration expenses, increased taxes and building insurance rates, investments in water-cooling and purifying facilities, fuel-storage tanks and necessary auxiliaries are usually omitted, it was claimed. Reserve capacity to permit overhauling, maintenance or accidental shut-down of a unit is usually not provided, and no provision is made for the expense of an emergency purchased-power connection. Until the customer has installed and operated a plant for some time he will not know whether his contract has provided for all expenses.

Speakers told of the performance of engines being based on short test runs that do not simulate customers' load curves and load factors that are assumed, which even a utility with all its diversity cannot obtain. Most of the installations to which prospects are being referred to are show-place installations, it was contended, in which manufacturers are taking a loss to make them attractive. It was reported that the operators in some plants are being paid a commission if any sales are developed among visitors.

As an answer to this form of competition with purchased power it was emphasized that nothing counts so much as having a record of friendly co-operation with customers, so they would voluntarily indicate any prospects of considering private plant generation so the power salesman can point out what expenses must be considered that might be overlooked in contracts.

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Reinforced Concrete Poles Popular for Economies

In England, but to a far greater degree on the Continent, reinforced concrete poles are being used for many types of services and in several different forms. This sort of line support there costs but little more in initial outlay than timber and less than half as much for maintenance. It is, as used abroad, considerably less expensive than steel in both respects.

Comparative first costs per mile, according to the *Electrical Review* (England), are: Wood, $1,040; steel, $1,378; reinforced concrete, $1,094. Maintenance costs per year are: Wood, $136; steel, $113; reinforced concrete, $65. According to the same source of information the savings in maintenance with the concrete supports has been equivalent to about $7 reduction per kilovolt in the net cost of distribution.

Single-pole concrete construction is used for some Italian 120-kv. lines and frequent use is made of this construction in 33-, 40- and 60-kv. service. In the case of the 6.6-kv. Barton-Filstone line in England 36-ft. poles are used with a unit cost of about $24 (delivered on site) without brackets. The weight per pole is 1,500 lb. The total cost per mile in this instance was $1,644, or "for all practical purposes no more than had timber poles been specified, because fewer concrete masts are required, and also because they do not need stay-wiring."

Major New Construction This Week

Motors, controls, transformers, conveyors, refrigerating machinery, etc., required for new plant of Hauser Brewing Company, Los Angeles, Calif. Cost about $400,000.

Michigan Public Service Company plans extensions in transmission and distributing lines at Whitehall, Mich., to cost about $40,000.

Two 1,000-kw. turbo-generators, condensers, boilers, stokers, pumps, transformers and accessories will be installed in new power plant of Jewell Ridge (Va.) Coal Corporation at mining properties near Richlands, Va. Cost close to $100,000. Also plans construction of 23,000-volt transmission line, about 6 miles long.

Motors, controls, conveyors, etc., will be installed in new loose-leaf binder plant of Wilson-Jones Company, Chicago, Ill., at Elizabeth, N. J. Cost over $80,000.

Burlingame, Calif., is considering plans for city-owned electric light and power plant. Estimated cost $863,000.

Motors, conveyors, etc., will be purchased by Dow Chemical Company, Midland, Mich., in connection with rebuilding. Cost about $100,000.

Motors, controls, refrigerating equipment, hoists and conveyors will be installed in new plant at Cincinnati, Ohio, of New Amsterdam Brewing Company, New York, N. Y. Estimated cost over $300,000. Company recently authorized similar plant at Middle Village, L. I., to cost $2,000,000.

New York Metal Prices

	March 7, 1933 Cents per Pound	March 14, 1933 Cents per Pound
Copper, electrolytic	5.00	5.75
Lead, Am. S. & R. price	3.00	3.35
Antimony	5.70*	6.25
Nickel ingot	35.00	35.00
Zinc, spot	2.70*	3.475
Tin, Straits	...	24.00
Aluminum, 99 per cent.	23.30	23.30

*Nominal

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Chain of Rocks Permit Denied

Denial of the application for a preliminary permit for a proposed power plant on the Mississippi River at Chain of Rocks, near St. Louis, Mo. (ELECTRICAL WORLD, September 10, 1932, page 327), has been denied by the Federal Power Commission. The denial was based, among other things, on an unfavorable report from the Chief of Engineers of the War Department, who saw adverse effects on navigation, aggravated flood conditions and injury to the navigable channel. Other reports indicated existing hydro developments in this region as now being used only to 46 per cent of their capacity.

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Delinquent Electrical Accounts

(National Electrical Credit Association)

Number of Accounts Reported

Division	February 1932	February 1933	Per Cent Inc. or Dec.	Two Months 1932	Two Months 1933	Per Cent Inc. or Dec.
New York	206	171	—17	426	345	—19
Middle and Southern Atlantic	87	53	—39	214	136	—36.5
New England	126	62	—50.8	229	124	—45.9
Central	492	256	—48	980	570	—41.8
Total	911	542	—40.5	1,849	1,175	—36.5

Total Amounts Reported

New York	$24,983	$12,476	—50	$45,376	$23,657	—47.9
Middle and Southern Atlantic	10,806	3,584	—66.8	25,001	8,305	—66.8
New England	13,582	5,183	—61.8	20,088	8,254	—58.9
Central	44,005	18,332	—58.3	85,732	40,188	—53.1
Total	$93,376	$39,575	—57.6	$176,197	$80,404	—54.4

Cables Rapidly Strung

By careful co-ordination of crew activities in the erection of its new 220-kv. transmission line between points near Baltimore and Washington the Pennsylvania Water & Power Company made notable speed. The line involved three 795,000-circ.-mil. A.C.S.R. conductors and two 203,200-circ. mil ground wires. It is about 22 miles long and the total length of wire to be strung was about 110 miles. This was accomplished in 20½ working days without a single broken strand or serious wire damage.

▼

Smithsburg, Md., Asks Rate Cut

Substantial decrease in the rates for electricity used for domestic and commercial purposes and for street lighting in the town has been requested by the burgess and commissioners of Smithsburg, Md., in a resolution sent to the Maryland Public Service Commission. City officials, maintaining that the street lighting rate of $26.11 per lamp per year charged by the Potomac Edison Company is too high, are seeking the reduction before entering into a new contract.

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G. E. to Push Air Conditioning

Newspaper advertising in each territory which will carry the signature of the dealer in that territory will appear in 45 cities and further the efforts of General Electric air-conditioning equipment dealers during 1933. According to J. J. Donovan the appropriation for this year will be twice that for the year 1932.

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Cincinnati Rate Base Survey

Seeking a basis for a new electric rate ordinance, to be enacted by it prior to June 30 when the present ordinance expires, the Cincinnati City Council has authorized the City Manager to contract with Burns & McDonnell Engineering Company for an investigation of the local situation. The value of the property of the Union Gas & Electric Company is to be fixed by the engineering firm upon the basis of an inventory of Cincinnati facilities prepared by the city Director of Public Utilities.

▼

Columbia Project Hopes Renewed

Renewed interest in the development of the Columbia River basin has followed President Roosevelt's espousal of public works programs as possible means of restoring prosperity. The Columbia development, indorsed by Army engineers as feasible and recommended by the federal reclamation service, is rated by its sponsors as the largest single project ready for adoption. So hopeful are proponents that they talk glibly of the possibilities of such a $400,000,000 scheme being self-liquidating and piling up a surplus of $250,000,000 in fourteen years. Skeptics are numerous.

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Cities Service Ban Upheld

That Cities Service Company and its fiscal agency, Henry L. Doherty & Company, must obtain a permit in order to sell securities of the former company in Kansas was the ruling of the state Supreme Court this week. This was an upholding of the Shawnee County District Court, which granted an injunction against the sale of Cities Service securities.

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Ontario Rules on Lamps

Establishment of standards for electric light bulbs has been made by the Hydro-Electric Power Commission of Ontario and effective May 1 the sale of those not conforming is prohibited. Retailers throughout the province have been advised that as soon as present stocks in their hands have been exhausted the sale of substandard lamps must be discontinued. Approval certificates are to be issued and stringent penalties provided for violation of the new regulations.

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Regulation in Alaska?

Among the major issues to be voted upon in the sessions of the Alaskan territorial Legislature is a proposal that better regulation of public utilities in Alaska be evolved. The cost of a regulatory commission is thought to preclude the likelihood of such action at this session.

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Illinois Consolidation Planned

Application by the companies involved for permission to consolidate has been filed with the Illinois Commerce Commission by three utilities of the Commonwealth & Southern system, serving that state. Illinois Power Company, serving Springfield, DeKalb, Sycamore, etc.; Central Illinois Light Company, serving the Peoria region, and Illinois Electric Power Company, operating a 46,400-kw. electric generating station in East Peoria, would operate as a single unit. Stockholders are to vote soon on the proposal. According to A. D. Mackie, vice-president Illinois Power, "the proposed consolidation involves no new financing, no change in the personnel of management or employees. It would permit substantial economies resultant from the considerably lower rate of interest at which our bonded indebtedness can be refunded.

Missouri Advertising Questioned

By a vote of 28 to 2 the Missouri Senate downed the proposal of Jerome Joffe to obtain a Senate investigation of a charge that the Missouri Association of Public Utilities had agreed to spend $100,000 to defeat legislation pending before the General Assembly. The Joffe proposal referred specifically to anti-merchandising statutes and centered around rural newspaper advertising.

▼

Pittsfield Works Gets Orders

Business at the Pittsfield works of the General Electric Company has kept up well in spite of unfavorable influences in the banking field. According to L. E. Underwood, manager, orders received in the large apparatus field were better last week than those received by the company in any other week in more than a year.

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Court Upholds Virginia Company

The United States Supreme Court has denied the Virginia State Corporation Commission a review of the ruling of Virginia courts (ELECTRICAL WORLD, February 18, page 216) directing the return to the Appalachian Electric Power Company of taxes paid in 1930 on certain bonds held by the company, but held in New York City under a mortgage and deed of trust.

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Oklahoma G. & E. Protests

Protesting that "It is doubtful whether this company in recent history ever has made a fair return," the Oklahoma Gas & Electric Company has filed reply to the order of the state Corporation Commission (ELECTRICAL WORLD, February 4, page 152) requesting statements from Oklahoma utilities regarding their rate reduction policies and actions. "Since utilities are not permitted to earn more than a fair return in times of prosperity they should not be compelled to reduce below this in times of depression," the reply stated. Rates have been reduced subsequent to the commission's inquiry by only one organization, the Oklahoma Utilities Company, which granted a 20 per cent cut.

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Single Commissioner for No. Carolina

Creation of a public utilities commission, headed by a single utilities commissioner, and abolition of the present State Corporation Commission of three members was voted last week by the North Carolina House. The bill passed the Senate and will become effective January 1, 1934.

15 Miles of Gaseous Tubes to Light the World's Fair

Most modern of light sources, gaseous discharge tubes will be called upon to do their spectacular best at the World's Fair Century of Progress Exposition in Chicago. According to recent estimates, when the exposition opens formally in June it is probable that between 75,000 and 100,000 ft. of gaseous discharge lighting will be in use on the grounds.

Among the more interesting developments is the recently announced cascade of green and blue light produced by 1½ miles of gaseous tubes on the windowless walls of the electrical building. This waterfall effect will be horseshoe-shaped, following the contour of the electrical building. Seven banks of green and blue colored gaseous tubes will rise 55 ft. vertically at intervals along the walls. Spray and steam rising from pools at the bottom of the walls will heighten the cascade effect.

A total of 7,500 ft. of gaseous tubes will be used for this illumination spectacle — the largest amount ever utilized for lighting the exterior of a single building. The tubes will be exposed and produce direct light, instead of being concealed, as is the case with gaseous lighting effects elsewhere on the exposition grounds. There will be no obvious supports for the tubes, thus increasing the mysterious effect their light will produce.

In addition to the exterior lighting, extensive use of gaseous tubes is made in interior lighting in the electrical building. In the great semi-circular hall in which exhibits will be presented by leading electrical companies, manufacturers of electrical equipment and utility companies 1,250 ft. of red-colored tubing and 1,200 ft. of gold-colored tubing is being installed.

The modernistic sculpturing on the hall of social science, which adjoins the electrical building, is lighted by 1,675 ft. of tubing in silver and blue colors. The agricultural building utilizes 2,000 ft. of gaseous tubing, including a 600-ft. installation of colored lighting along the top of the roof. Other installations of gaseous tubing include: Dairy building, 600 ft.; general exhibits building, 1,200 ft.; Chrysler building, 2,000 ft.; extreme portals, 3,500 ft.

The hall of science, first exposition building to be illuminated at night, utilizes 4,760 ft. of vari-colored gaseous tubing for exterior lighting effects, including the 176-ft. tower and for part of the illumination in the great hall.

A new utilization of neon illumination is being introduced in the Illinois Central System's exhibit. On a wall map the neon light animating the railroad's suburban service appears to travel, although the gas is in a continuous tube. This new means of controlling the light area of neon gas is accomplished by means of a shunt circuit.

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New French Wiring Rules Would Reduce Ship Hazards

Following the most recent of several fires on French ships (ELECTRICAL WORLD, January 28, page 114), the French Ministry of the Merchant Marine has issued regulations for all passenger vessels of more than 10,000 tons, calling for electric lighting and power installations of the lowest reasonable voltage, suitable insulated single-conductor cables, cables having a steel wire or metal strip sheathing to be fixed by metal clips to the angle irons in contact with the hull, or if the use of the angle irons is difficult the conductors should be secured to the deck planking and given a metallic connection to the hull and, so far as possible, all electric wiring and cables should be visible; if this is not the case they must be so installed as to be readily accessible for inspection and maintenance purposes. Another regulation requires that all fuses used must be of a safety type that cannot be tampered with; furthermore, they must only be accessible to the officers and authorized seamen.

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Economical Arc Welding at Boston City Hospital

Electric arc welding with its advantages of noiseless performance in the field and convenience of manipulation featured the construction of the new pediatric building at the Boston City Hospital, the length of equivalent ⅜-in. fillet per kilowatt-hour obtained being 7.07 in. This represents the minimum figure obtained in several structural building jobs compared by the Whitney Engineering Company, Boston, which handled the work. The building contains 492 tons of structural steel and the total welding hours in the field was 557, the energy consumption being 4,150 kw.-hr. as metered by the Boston Edison Company.

The total electrode melted was 896 lb., the length of all fillets being 25,686 in. The length of ⅜-in. fillets was 20,606 in. and of ½-in. fillets 4,860 in., the balance being smaller than ⅜ in. The job consumed three welding machine months. Per welding hour 46.1 in. of fillet of all sizes was welded, or 22.9 in. per pound of electrode used and wasted, and 28.67 in. per pound of electrode melted. The fillet weld per kilowatt-hour was 6.19 in. The electrode melted per kilowatt-hour was 0.22 lb., or 1.82 lb. per ton of steel in the building. The welding hours per ton of steel in the structure were 1.13.

Central Station Exhibit a World's Fair Feature

Utilization of electricity in the home, on the farm, in business and in industry rather than the technique of its generation and distribution or any historical presentation of the art will be the main theme of the electrical central-station industry exhibit which will extend for 550 ft. on a semi-circular front in the main electrical building of the Century of Progress Exposition in Chicago this summer.

The utilization of electricity is portrayed in the exhibit in six general groups, mostly in demonstrations of full-sized equipment and installation. Resort to miniature presentations is taken only in cases in which full-size reproduction is impracticable. In the display of electric service in the home there will be a living room, kitchen and basement, each equipped with its appropriate services and appliances. A feature of the kitchen that should have striking effect will be a perspective into a kitchen of yesterday, which by contrast will enhance the appeal of the modern room. Farm electrification will be shown in a model of a complete farmstead and the details of this general picture will be filled in with thirty or more demonstrations of actual applications of electricity to farm uses. Five modern designs of shops and stores will demonstrate commercial application principles, particularly the great value of electric light as a selling force. Electrical uses in education and in medicine and surgery will appear in an extensive display of modern ideas in schools and hospitals. Emphasis in the industrial display will be on electric heat.

Some who will exhibit

Electrical companies which have signed contracts for exhibit space or buildings at the Century of Progress Exposition include: Altorfer Brothers Company, American Telephone & Telegraph Company, Century Electric Company, Chicago Flexible Shaft Company, Conover Company, Crane Company, Curtis Lighting, Inc., Delta Manufacturing Company, Electric Storage Battery Company, Electrical Central Station Company, Federal Electric Company, Inc., General Electric Company, Hammond Clock Company, Hoover Company, International Telephone & Telegraph Company, Kelvinator Corporation, Norge Corporation, Radio Corporation of America, Reynolds Exhibits Corporation, Sangamo Electric Company, Singer Manufacturing Company, Stewart Warner Corporation, United Air Cleaner Corporation, Van Cleef Brothers, Waters Genter Company, Western Union Telegraph Company, and Westinghouse Electric & Manufacturing Company

EDITORIALS

L. W. W. MORROW
Editor

The conflict between cash and new business

A MARKED difference is apparent between the executives of holding companies and the heads of operating companies in their attitude toward business development. This attitude comes naturally out of experience and responsibility and the atmosphere in which the man works. The holding company head has a financial background and views declining earnings with the utmost concern, and from this standpoint the quickest way to safeguard his position seems to be to reduce expenses. So he puts pressure on the operating company to control every activity not essential to running the system and collecting the revenue.

But the operating executive is wrapped up in the life and health of the company. He has watched the load grow. He realizes that markets abandoned now must be laboriously built up again later on and at great cost. He sees that this economy program he is being compelled to follow is forcing the submergence of business promotional activities which actually call for equal attention. He believes that there are other values besides cash that need conserving in the present emergency.

After all, a power company is a business. Like every business enterprise it must be nourished and sustained by continuous and consistent creative selling. New customers and increased load must be steadily secured to offset the never-ceasing losses that are inescapable. Factories are partly running or closed down. Offices have reduced staffs; merchants are saving light. In the home people are learning to cut out luxuries and comforts. The free habitual use of electricity, built up over years of effort, is now under attack at every point, and the only defense is vigorous, intelligent advertising and selling.

Power companies must save cash. That is true. But they must also conserve their business and avoid the abandonment of markets. A sound policy of conservation calls for a balance in this conflict between the needs of cash and new business.

Rates, sales, dreams— St. Lawrence Power

THREE months ago it did not seem possible to compute St. Lawrence power in New York City at anything less than 6.5 or 6 mills per kilowatt-hour. This estimate (ELECTRICAL WORLD, December 24, 1932) was based on a 40 per cent load factor. Several things have happened to warrant accepting, at least for argument, a figure of 5 mills. This latter is the value estimated by the Power Authority in reporting to the New York Legislature. First, the state's share of the construction cost has been brought down to $89,726,000. Second, the commission believes the 5 per cent interest can be paid on the state's bonds, 1 per cent set aside for 40-year amortization and $1,400,000 provided for renewals, maintenance and operation by means of a lump annual charge of $6,800,000. Third, it is believed that a load factor of 50 per cent can be sustained on the firm output because of the

promotional effect of an envisioned 3-cent rate for domestic usage.

On that basis it is possible to show a 5-mill delivery cost if five 300-mile lines cost no more than $30,000 per mile, 500,000-kw. substations cost no more than $15,000,000 and 8 per cent is enough annual charge to cover interest, amortization, losses, operation and maintenance on transmission and transformation. But those are lower figures than many in the industry could accept. Even at 5 mills the power would have to face the prospect of more reliable steam competition of 5-mill generation or less at the load center under similar load conditions.

The project has moved measurably nearer economic justification on paper. One unanswered problem is still the matter of stimulating the load. Who will bear the brunt of inspiring a 500,000-kw., 50 per cent load factor load to be ready at exactly the time the delivery is ready? If that is not accomplishable, what will several years of idle capacity do to the rosy picture of complete amortization in 40 years and free power forever after? Will no steam reserves whatever be necessary to back up such a huge block of hydro? To justify the Power Authority's dream it will take a 3-cent rate, 3,000,000 man-hours of selling and $30,000,000 worth of appliances to create the necessary 3,000-kw.-hr. homes. It might be easier, if not in the public interest to the same degree, to use all the power at the site to produce the essential products in primary industries for national distribution.

Value measurements change in depression periods

REVIVED impetus has been given to the prudent investment concept of value for regulation purposes. Some utilities have been leaning that way of late while the critics were swinging toward the reproduction cost basis. Well, in fact, there is little choice in the long run. Whichever is applied, it has its defects, but for "prudent investment" it can at least be said that it does hinge less on judgment and opinion than the alternative concept does. Could one start from scratch, the prudent investment evaluation should be essentially determinable from the running account of initial plant and the subsequent net additions and betterments. Its weakness rests primarily in the inability to start from scratch in any instance and in fluctuating dollar values.

In view of this difficulty there is appeal in the simplicity of the reproduction approach to present value. But the worst defect of the reproduction determination is not in the large element of judgment that it entails, nor in the unjustness of its application in periods of very high or very low prices, but in the simple fact that often there are no true reproduction costs in a period of low prices. High prices occur in boom periods, when every one builds in anticipation of a bigger and even more expansive boom. Low prices occur in slump periods, when demands fall and no one has the need or courage to build. Quoted or actual prices in the utility field are then often really not significant, because they are either distress prices or prices aimed at getting a bit of business even at a loss, or else they are likely to be taken from consumer commodity prices where transactions are actually occurring. The latter procedure is open to question merely because market commodities assume a special status when applied in the utility field. Structural steel and high-pressure pipe for power plants are largely specialized products; formed windings for high-voltage turbo-alternators are not affected as much by five-cent copper as would be triple-braid. weatherproof wire, and so on.

On the whole, actual justifiable investment, in spite of fluctuations in the purchasing capacity of dollars, has a bit less risk of inequity for either party than reproduction cost, largely because the investments are recorded only if and when they are made, whereas reproduction costs apply even if they would not be incurred under prudent management. In times of moderate fluctuation of the dollar there was plenty of reason for favoring reproduction theory as having fairness and equity, but when the dollar goes to utter extremes the virtues fail. The loss in affection is not due to the feared punishment that it may apply to an honest utility, but to the fact that reproduction prices really do not apply at all when no expenditures of consequence are being made. In the final analysis, value cannot be reduced to a formula and fair value still remains an essential judgment decision to exercise in valuation for the several purposes necessitating determination of value.

Distribution Costs Subjected to New Analysis

COSTS of electrical distribution were disclosed from a multiplicity of sources at the recent meeting of the Institute of Public Engineering held in New York. In particular, a comprehensive breakdown by Clayton W. Pike of the annual reports of utility companies to the New York Public Service Commission for 1930 provided the bulk of the data. A moderate amount of estimation and approximation was found necessary by him in arriving at the generalized results because some items still are divided between two or more functional portions of the system even though there has been progress in segregating them in the more recent report forms. Out of these analyses Mr. Pike evolved a formula which gives cost in terms of number of customers, their usage, the line mileage and the proportion of underground.

At the outset it was established that distribution investment per customer (see Table I) showed far less variation than any result obtainable by approximating demands and ascertaining costs per kilowatt of such demand. Size of distribution transformers is directly affected by increase in customer demand. With proper regard for variation in the relation between transformer size and cost this item is incorporated in the formula to represent an average size of customer. Likewise the average length of wire per customer (Table II) is used as the index of customer density. Incidental to this last item it was established (Table III) that the average cost of poles, crossarms, pins, insulators and wires per foot of wire is about 10 cents, divided about equally between wire and the other items.

Proportion of underground varies from system to system to such a degree as to necessitate the inclusion in the formula of a term to correct for the otherwise inevitable inconsistencies that would appear if ignored or assumed to be a uniform characteristic. A prominent disturbing factor, when underground costs are expressed in terms of wire length, is the extent of unoccupied ducts. Underground costs for twelve companies ranged from \$0.45 to \$0.92, with an average of \$0.73, which was, however, scaled down to \$0.65 to allow for other than average residence usage of underground systems.

All elements embraced in formula

The equation for distribution investment, I, is in the form

$$I = aw + bx + cy + dz$$

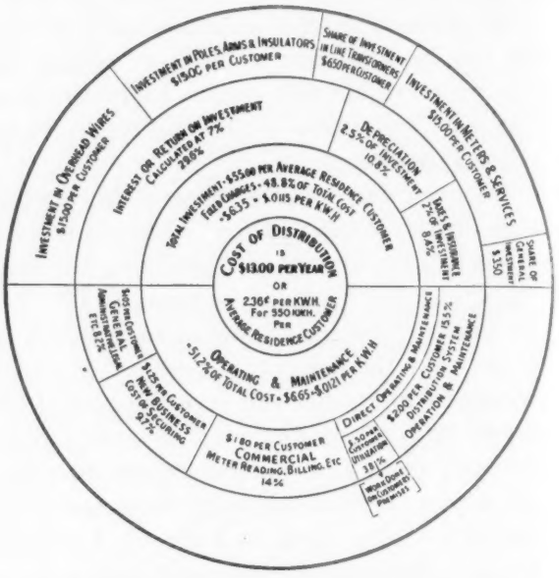
in which a, b, c, d are numerical constants and

w = number of customers.

x = kw.-hr. per year per average customer.

y = a term representing the average length of distribution wire per customer.

z = a term introducing the proportion of underground distribution.


Investment in Poles, Arms & Insulators $150 per Customer
Share of Investment in Line Transformers $650 per Customer
Investment in Meters & Services $150 per Customer
Investment in Overhead Wires $1500 per Customer
Interest or Return on Investment Calculated at 7% 28.0%
Depreciation 2.5% of Investment 10.8%
Taxes & Insurance 2% of Investment 8.4%
Share of General Investment $350
Total Investment-$5500 per Average Residence Customer
Fixed Charges-48.8% of Total Cost
$635 + $.015 per KW.H
Cost of Distribution is $13.00 per Year or 2.36¢ per KW.H. for 550 KWH. per Average Residence Customer
Operating & Maintenance 51.2% of Total Cost-$665-$.0121 per KW.H
Substations Operations General & Administrative Expenses Etc 8.2%
$4.25 per Customer for Billing Cost of Securing 9.2%
$1.80 per Customer Commercial Meter Reading, Billing, Etc 14%
Direct Operating & Maintenance $2.00 per Customer 15.5% Distribution System Operation & Maintenance
2.50 per Customer Utilization 38%
Work Done on Customer's Premises

Residential distribution costs summarized

This diagram summarizes the conclusions in Major Pike's paper. Investment items are above the horizontal diameter. Capital items are in the outer circle, the fixed charges on them in the next circle and the lumped total in the next circle. Annual expense items are grouped in the lower semicircle. The center then presents the over-all annual cost for a typical 550-kw.-hr. customer.

With numerical values inserted the investment per average customer is

$$I = \$65 + \$0.05 \text{ (kw.-hr.} - 550) + \$0.08 \text{ (feet of conductor} - 500) + \$0.65 \text{ (feet of underground conductor)}.$$

The \$65 is made up of poles and wires (\$32) for a 550-kw.-hr. average customer, line transformers (\$10), meters and services (\$19) and allocated share of general investment (\$4). General investment, in accordance with N.E.L.A. Bulletin No. 7 (Table IX, June, 1931), is set at 11.5 per cent of the total; generation, 29 per cent; transmission, including substations, 31.5 per cent; distribution, 28 per cent. Data from New York Edison, Brooklyn Edison, Buffalo General Electric, Philadelphia Electric, Duquesne Light and West Penn Power companies shows that "general" represents 6 per cent of fixed capital. Distribution's share of general investment is thus $0.28 \times 0.06 \div 0.255 = 6.82$ per cent. This is what established the \$4 item for general investment allocated to distrbution (\$61 × 0.0682). These are figures for an average customer, the greatest value of which is to serve as a yardstick in estimating corresponding figures for an average residence customer which we know will be less.

Believing that not more than 50 per cent of the pole and wire investment is subject to increase proportional

to increased usage, the pole and line increment in investment per kilowatt-hour is taken as $15 divided by 550 or $0.0273. The increment line transformer investment for each additional annual kilowatt-hour over 550 for a 550-kw.-hr. customer is set at one-half of $6.50 divided by 550 or $0.0059. For similar reasons the service and meter value of $15 is halved and divided by 550 to obtain $0.0137. The transformer figure of $6.50 per customer was arrived at as follows:

Analysis of the reports of seventeen New York companies and four large systems elsewhere showed a range from $5.35 (New York Edison) to $32.60 (Paul Smiths Electric Light & Power) for line transformer investment per average customer. From generally available data on diversities and demands of such customers Mr. Pike decides upon 0.45 kw. demand and thus chooses a figure of $6.50 as fairly averaging the spread from 1½ kw. installed cost of $15 to $16.50 and $5 to $5.50 for 10-kw. sizes when reduced to 0.45 demand per customer.

Table I—Distribution Investment in Relation to Number of Customers

	Kw.-Hr. Per Active Meter		Feet Wire Per Customer*	Investment Per Customer				
	Total (1)	Using Distribution (2)	(3)	Poles, Wires Conduits and Cable (4)	Line Transformers (5)	Services (6)	Meters (7)	Total of Cols. 4, 5, 6, 7 (8)
Lake Ontario Power Corp.	1,220	532	998	$114.30	$24.30	$22.40	$16.70	$177.40
Niagara Electric Service	2,690	2,470	301	36.60	17.50	6.46	14.70	75.26
Empire Gas & Electric	2,220	2,010	462	64.50	17.00	6.62	12.20	100.32
Peoples Gas & Electric, Oswego	6,240	592	430	48.25	14.20	7.40	16.05	85.90
Orange & Rockland Electric Co.	1,540	994	564	78.60	18.10	8.43	15.15	120.28
Malone Lighting & Power Co.	2,720	672	1,100	57.30	28.10	7.80	13.80	107.10
Paul Smiths Elec. Light & Power	2,630	1,620	833	70.40	32.60	9.34	17.15	129.49
Central Hudson Gas & Elec. Co.	2,660	1,710	522	86.30	20.75	10.50	13.40	130.95
Elmira Water, Lighting & R.R.	3,520	1,980	628	75.50	13.15	7.75	13.00	109.40
N. Y. State Elec. & Gas Co.	2,390	1,785	837	93.30	19.70	10.05	13.65	135.70
Long Island Lighting Co.	1,245	1,170	534	61.60	14.60	8.53	11.90	96.63
Northern New York Utilities	20,500	860	487	57.50	16.80	8.35	11.85	94.50
Staten Island Edison Co.	3,100	1,850	287	57.00	12.10	6.10	13.60	88.80
St. Lawrence County	25,800	697	665	37.70	16.10	7.70	13.45	74.45
Tonawanda Power	8,460	1,050	555	80.50	24.90	8.57	15.50	129.47
Buffalo General Electric Co.	5,740	.....	.....	39.60	11.70	7.45	13.20	72.05
New York Edison Co.	2,290	2,200	.....	39.60	5.35	17.65	14.90	77.50
Cleveland Elec. Ill. Co.	3,400	.....	.....	51.00	12.60	9.95	10.90	84.45
Detroit Edison Co.	6,670	.....	.....	73.90	9.40	6.80	12.92	103.02
Philadelphia Electric Co.	3,830	.....	.....	41.60	13.15	11.60	16.00	82.35
West Penn Power Co.	9,000	.....	.....	31.80	16.70	10.42	17.10	76.02

*Number of feet of distribution wire, less street lighting, per customer.

These increments therefore total as follows to establish the 0.05 coefficient in the formula to cover kilowatt-hours above the 550 average:

Pole and line	$0.0273
Transformer	0.0059
Service and meter	0.0137
General	0.0031
	$0.0500

So much for the investment analysis presented by C. W. Pike. The rest of his study, reported to the Power Authority of the State of New York, as presented at the meeting was devoted to allocation of annual expense items in percentage of distribution investment.

The seventeen New York and other companies showed an average distribution expense ratio to distribution investment of 2.97 per cent for the average customer. For an average *residential* customer 3.5 per cent is taken as reasonable. Thus 3.5 per cent of $55 is $2 per year per customer. Utilization expense for the average residence customer is taken at $0.50, commercial at $1.80, new business at $1.25 and general at $1.05.

Table II—Distribution—Average Feet of Wire per Customer

	Distribution Conductors Overhead No. Feet (1)	Street Lamps 1927 P.S.C. An. Rep. (2)	Lighting No. Ft. Conductors (2)×500 Ft. (3)	Distribution Conductors Less Street Lighting (1)—(3) (4)	Number Active Meters (5)	Kw.-Hr. per Customer (6)	Distribution Conductors Feet per Customer (4)÷(5) (7)	Distribution Conductors Investment in Poles and Wire (8)
Fulton Light, Heat & Power	2,050,955	.....	226,000	1,824,955	3,655	650	502	144,664
Lake Ontario Power Corporation	5,538,595	804	402,000	5,136,595	5,146	1,218	998	587,500
Niagara Electric Service	7,683,505	2,276	1,138,000	6,545,505	21,739	2,480	301	696,600
Empire Gas & Electric	16,012,866	5,449	2,724,500	13,288,366	27,778	2,210	462	1,352,500
Peoples Gas & Electric, Oswego	3,632,944	1,017	508,500	3,124,444	7,275	6,250	430	321,328
Orange & Rockland Electric Company	5,822,725	2,700	1,350,000	4,472,725	7,933	1,543	564	622,771
Malone Light & Power	6,147,442	1,168	584,000	5,563,442	5,565	2,720	1,100	313,000
Paul Smiths Electric Light & Power	3,184,577	560	280,000	2,904,577	3,831	1,620	833	254,000
Totals and average	50,073,609	.....	7,213,000	42,860,609	82,922	.....	516	4,292,363
Central Hudson Gas & Electric Company	36,062,303	8,892	4,446,000	31,616,303	60,739	1,710	522	4,560,431
Elmira Water, Lighting and Railroad	13,824,203	2,621	1,310,500	12,513,703	19,939	1,980	628	1,504,795
New York State Electric & Gas Company	119,804,508	5,561	2,780,500	117,024,008	139,861	1,785	837	12,535,000
Long Island Lighting Company	65,110,811	21,451	10,725,500	54,385,311	101,775	950	534	5,549,706
Northern New York Utilities	15,444,205	2,749	1,374,500	14,069,705	28,923	860	487	1,546,177
Staten Island Edison Company	16,418,575	9,076	4,538,000	11,880,575	41,403	1,850	287	2,340,000
Tonawanda Power Company	6,473,428	2,141	1,070,500	5,402,928	9,726	1,050	555	675,821
Yonkers Electric Light & Power Company	7,307,588	.....	750,000	6,511,588	39,877	1,200	163	1,511,606
Totals and averages	280,445,621	.....	26,995,500	253,404,121	442,243	.....	572	30,223,836
Grand totals and averages	330,519,230	.....	*34,208,500	296,264,730	525,165	.....	563	34,516,199

*It will be noted that street lighting conductors average 10.3 per cent of total overhead conductors in length.

Appendix VIII of the original paper indicates that the cost of the distribution conductors per customer is about the same as the cost of poles, crossarms, braces, pins, etc.

Table III—Investment in Poles, Arms and Wires per Foot of Overhead Wires

Company	Investment in Wires	Feet of Overhead Wire	Investment Per Foot of Wire (1)÷(2)	In Poles	Investment In Poles and Wires (1)+(4)	Per Foot of Wire (5)÷(2)	Kw.-Hr. per Meter Using Distribution
Small Companies	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Patchogue Electric Light Company	$147,000	3,540,789	$0.0415	$117,600	$264,600	$0.075	905
Lake Ontario Power	273,000	5,538,595	0.0494	314,500	587,500	0.106	1,218
Niagara Electric Service	378,727	7,683,505	0.0492	317,873	696,600	0.091	2,480
Empire Gas & Electric	695,000	16,012,866	0.0433	657,500	1,352,500	0.085	2,210
Malone Light & Power	126,000	6,147,442	0.0205	187,000	313,000	0.051	2,720
Paul Smiths	141,000	3,184,577	0.0443	113,000	254,000	0.079	1,620
People's Gas & Electric	159,286	3,632,944	0.0440	182,242	321,528	0.089	6,250
Oswegatchie	42,672	1,730,911	0.0247	64,119	106,791	0.062	715
Orange & Rockland	314,771	5,822,725	0.0540	308,000	622,771	0.101	1,543
Totals and averages	$2,277,256	53,294,354	0.0427	2,241,834	4,519,290	0.085	.....
Medium Companies							
Central Hudson Gas & Electric	$2,124,073	36,062,303	$0.0598	$2,436,358	$4,560,431	$0.126	1,710
Elmira Water, Light & Railroad Company	838,795	13,824,203	0.0606	666,000	1,504,795	0.109	1,980
New York State Electric & Gas Corporation	5,950,000	119,804,508	0.0497	6,585,000	12,535,000	0.104	1,785
Long Island Lighting Company	2,946,133	65,110,811	0.0530	2,603,573	5,549,706	0.085	950
Rochester Gas & Electric Corporation	1,640,000	30,376,408	0.0540	2,275,000	3,915,000	0.129	2,070
Northern New York Utilities	661,532	15,444,205	0.0428	884,945	1,546,477	0.10	860
Staten Island Edison Corporation	120,000	16,418,575	0.0742*	1,120,000	2,340,000	0.142	1,850
Tonawanda Power Company	374,482	6,473,428	0.0578	301,339	675,821	0.105	1,050
Totals and averages	15,755,015	303,514,441	0.052	16,872,215	32,627,230	0.1075	.....
Grand totals and averages	18,032,271	367,551,604	0.0491	19,114,049	39,039,255	0.106	.....

* Relatively large size wires.

A considerable degree of confirmation of Mr. Pike's data was found in an extensive analysis of the statistics of the Los Angeles Bureau of Power and Light submitted by T. A. Panter, electrical engineer. His figure for the distribution investment per average residence customer is $53.50, against $55 by Pike. Annual expense totals $6.95, against $6.60. Fixed charges amount to 7.6 per cent, as against Pike's 11.5 per cent, but do not include taxes and use of 4.07 per cent for interest, compared to Pike's 7 per cent. The total annual cost per average residence customer is thus $11.02, against Pike's $12.95 (for 537 and 550 kw.-hr. customers respectively). Panter finds $225 per kilowatt of distribution maximum demand, versus Pike's averages of $219 and $302.85 respectively for small and medium systems.

Table IV—Utilization Expense per Customer

Company	Utilization Expense (Omitting Street Lighting)	Number of Customers	Per Customer
Lake Ontario Power Corporation	$502.59	5,146	$0.097
Niagara Electric Service Corporation	32,038.86	21,739	1.475
Empire Gas & Electric	23,758.76	27,778	0.855
Peoples Gas & Electric, Oswego	6,297.23	7,275	0.866
Malone Lighting & Power Company	1,974.30	5,565	0.35
Paul Smiths	44.62	3,831	0.01
Yonkers Electric	70,225.28	39,877	1.76
Totals and averages	$134,841.64	119,144	$1.13
Central Hudson Gas & Elec. Company	$40,403.79	60,739	$0.66
Elmira Water, Lighting & Railroad	10,413.94	19,939	0.52
New York State Elec. & Gas Company	89,842.30	139,861	0.64
Long Island Lighting Company	1,703.80	101,775	0.02
Rochester Gas & Electric Corporation	99,527.98	116,677	0.85
Northern New York Utilities	32,221.81	28,923	1.11
Staten Island Edison Company	36,926.33	41,403	0.89
St. Lawrence County Utilities	3,937.17	12,464	0.32
Tonawanda Power Company	8,213.18	9,726	0.84
Totals and averages	$323,190.30	531,507	$0.608
Grand totals and averages	$458,031.94	650,651	$0.703

Service and meter investment per customer totals $29.90 in Los Angeles and $21.40 in the Pike paper, probably partly accounted for by wider streets in the California city. In Los Angeles poles, wires, conduits and cables total $73.80 and line transformers represent $23.60, making a total distribution investment per customer of $127.30, against Pike's average of $106. Los Angeles finds 300 ft. of wire per customer instead of Pike's estimated 500, and consequently the investment per foot of wire is $0.15, against Pike's $0.106. Underground in Los Angeles shows a cost of $2.73 per foot of underground conductor, for which Pike sets $0.73. The high figure apparently results from much advance construction.

Distribution's share of general investment is set at 5.9 per cent by Panter. He also agrees with Pike's 0.45 kw. demand per residence customer, but sets transformer costs at $6 per customer instead of $6.50. Distribution expense is $4.70, against Pike's average $3.46. Utilization expense is $0.93 (against $0.703), commercial $2.64 (against $3.22), new business $1.33 (against $1.81) and general expense allocated to distribution $1.94 (against $1.74).

Generation and distribution operation

Unit investment values for municipal distribution systems were submitted by R. E. McDonnell. Costs per square mile ranged from $27,600 (Fergus Falls, Minn.) to $120,500 (Galveston, Tex.). Population density ranged from 1,840 to 8,530 (same two communities) and the costs per service fell between $49 (Marietta, Ohio) and $116.50 (Columbia, Mo.), with customer densities of 4,760 and 3,560 respectively. For a mixed group of municipal and private utilities the total annual operating expense per customer, exclusive of production, showed a spread from $6.23 (Hastings, Neb.) to $36.80 (El Paso, Tex.). Maintenance and operation of distribution system for thirteen properties revealed values from $2.30 to $5.48 per year per customer. Cleveland,

Pasadena, Tacoma and Springfield, Ill., were in the group with values of $2.83, $3.52, $2.39 and $2.88 respectively, with a group average of $3.70, compared with Pike's figure of $3.46.

Ahead of distribution investments are the investments and annual costs of substations, transmission and generation. Data on these points were supplied by several contributors. Roy Husselman, after analyzing the significance of the recent Martinsville, Ind., "gateway rate" decision and the method by which commission and court arrived at the figure of 1.72 cents for this town of 2,000 population, cited the average wholesale price per kilowatt-hour paid by six small municipals in Indiana, Pennsylvania and West Virginia and two small private enterprises. The rates averaged $0.0147, with a spread from $0.0114 to $0.0185 for from 686,500 to 3,878,900 kw.-hr. per year.

T. Herbert Clegg presented data from 45 municipals which buy and distribute power, in all some 200,000,000 kw.-hr., showing a range from $0.009 to $0.026, with an over-all average of $0.013, broken up as follows:

36	Power company owns all or part of substation equipment	103,734,836 kw.-hr.	$0.0157
9	Municipality owning all substation equipment	97,544,988 kw.-hr.	0.01016
45		201,279,824	$0.013

Table V—Commercial Expense

Company	Commercial Expense	Number of Customers	Per Average Customer
Lake Ontario Power Corporation	$19,004	5,146	$3.69
Niagara Electric Service Corporation	80,747	21,739	3.71
Empire Gas & Electric	104,788	27,778	3.78
Peoples Gas & Electric, Oswego	15,073	7,275	2.07
Orange & Rockland Electric Company	18,393	7,933	2.32
Totals and averages	$238,005	69,871	$3.40
Central Hudson Gas & Electric Company	$422,342	60,739	$6.95
Elmira Water, Lighting & Railroad	35,542	19,939	1.77
New York State Electric & Gas Company	685,460	139,861	4.75
Long Island Lighting Company	381,861	101,775	3.75
Rochester Electric & Gas Company	335,428	116,677	2.87
Northern New York Utilities	79,581	28,923	2.76
Staten Island Edison Company	163,780	41,403	3.96
St. Lawrence County	52,589	12,464	4.21
Tonawanda Power Company	30,815	9,726	3.16
Niagara, Lockport & Ontario	231,614	57,269	4.04
Totals and averages	$2,419,012	588,776	$4.11
Buffalo General Electric Company	402,929	174,040	$2.31
Cleveland Electric Illuminating	590,487	294,062	2.01
Duquesne Lighting Company	738,566	311,448	2.38
Detroit Edison Company	2,120,601	550,072	3.85
Philadelphia Electric Company	1,487,330	522,833	2.85
West Pennsylvania Power	393,586	107,904	3.65
Totals and averages	$5,733,499	1,960,355	$2.93
Grand totals and averages	$8,390,509	2,619,002	$3.22

Table VI—New Business Expense

Company	New Business Expense (1)	Number of Customers (2)	Per Average Customer (1)÷(2) (3)
Lake Ontario Power Corporation	$9,757	5,146	$1.90
Niagara Electric Service Corporation	64,130	21,739	2.95
Empire Gas & Electric	145,801	27,778	5.25
Peoples Gas & Electric, Oswego	16,487	7,275	2.27
Orange & Rockland Electric Company	11,745	7,933	1.48
Totals and averages	$247,922	69,871	$3.55
Central Hudson Gas & Electric Company	$282,595	60,739	$4.65
Elmira Water, Lighting & Railroad	78,535	19,939	3.92
New York State Elec. & Gas Corporation	735,077	139,861	5.04
Long Island Lighting Company	107,578	101,775	1.06
Rochester Gas & Electric Corporation	392,134	116,677	3.36
Northern New York Utilities	56,006	28,923	1.94
Staten Island Edison Company	210,608	41,403	5.10
St. Lawrence County	15,749	12,464	1.26
Tonawanda Power Company	10,811	9,726	1.11
Niagara, Lockport & Ontario	183,678	57,269	3.20
Totals and averages	$2,072,771	588,776	$3.51
Buffalo General Electric Company	$318,730	174,040	$1.83
New York Edison	1,582,659	846,316	1.87
Cleveland Electric Illuminating	233,323	294,062	79
Duquesne Lighting Company	333,425	311,448	1.07
Detroit Edison	439,587	550,072	80
Philadelphia Electric	815,379	522,833	1.56
West Pennsylvania Power	235,217	107,904	2.18
Totals and averages	$3,958,320	2,806,675	$1.41
Grand totals and averages	$6,279,013	3,465,322	$1.81

Do Electric Boilers Offer an Opportunity?

Because so many large electric steam boilers are used in Canada* the question has been raised, "Why can't utilities in the United States sell power for this purpose to industrials at increment costs plus a profit while their systems are greatly underloaded and thus obtain a revenue they would not secure otherwise?" It has been argued by some proponents that most utilities would not have to increase their system investment under present conditions, and that individual service equipment, such as transformers and circuit breakers, could be moved from positions where it is now unused.

The response of one important utility to this proposal brings out some of the many points that must be considered:

"We do not believe that there is any possibility of our company being able to sell either steam generated in electric steam generators or to sell energy to generate steam in electric steam generators at a rate which would prove attractive to our customers and still yield a profit over and above our cost.

"The article* referring to low rate power in Canada was, of course, considering generation by hydro-electric plants. In our system the periods when there is surplus hydro power are confined to a relatively few hours per year and these hours generally occur within three or four months. Low rate power would therefore have to be generated in fuel-burning plants.

"The percentage of the heat fed to central-station boilers to that delivered to the customers' steam generators, even with the most efficient power stations, could hardly exceed 25 per cent. The industrial plant therefore must pay a considerably higher cost for fuel or operate at very low boiler efficiency in order to make the

*See ELECTRICAL WORLD, *February 18, 1933, page 214*

power anywhere near competitive to the raw-fuel prices. The other costs of steam production, such as labor, maintenance, supplies and expenses, tend to make up some of this spread.

"In a specific case which was examined the customer is now purchasing anthracite at $3.50 per long ton and obtaining 6 lb. of steam per pound of coal. Steam costs, on this basis, 0.026 cent per pound. One kilowatt-hour could produce 3 lb. of steam and therefore have to sell for 0.078 cent to compete against the fuel price alone. In this particular case the customer was satisfied that labor and maintenance savings would permit him to pay 0.25 cent per kilowatt-hour.

"In a recent check made on a comparison of the months of good hydro production with the months of low hydro production it was found that the increment additional steam-generated energy in the low-flow months cost 0.25 cent. The company, therefore, if it accepted a rate of 0.25 cent, would be exchanging dollars without allowing for any transmission losses and without making any margin of profit. In addition, either the buyer or the seller would have to provide for the carrying charges on the electric steam generators.

"The amortization rate would be relatively high as, after a return to normal business conditions, it will be necessary to restrict the hours of use of low-rate energy to the night periods, and even at the present it is doubtful whether the electric steam generators could be used more than 600 hours per month without increasing the customers' demand with unrestricted use.

"There are also serious public relation and commission-attitude problems which would also have to be confronted before making any temporary rates which would last merely during the depression, and it would probably be difficult to make a revision upward in the rates at a later date."

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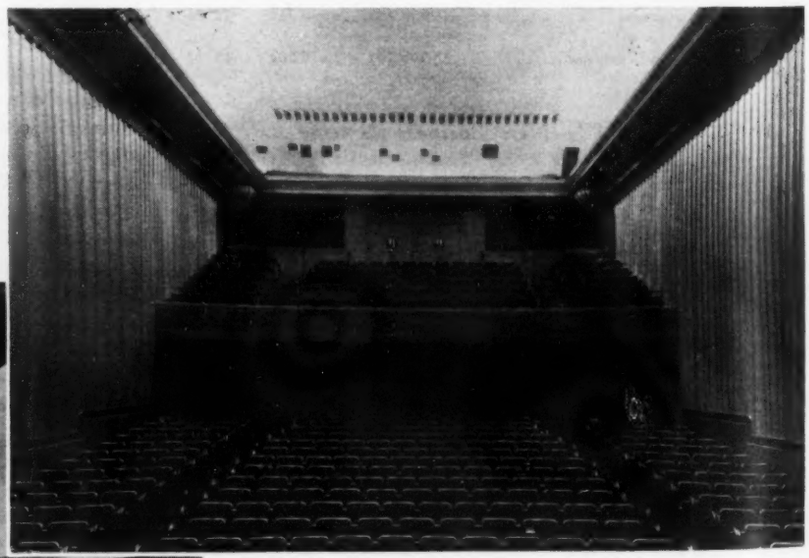
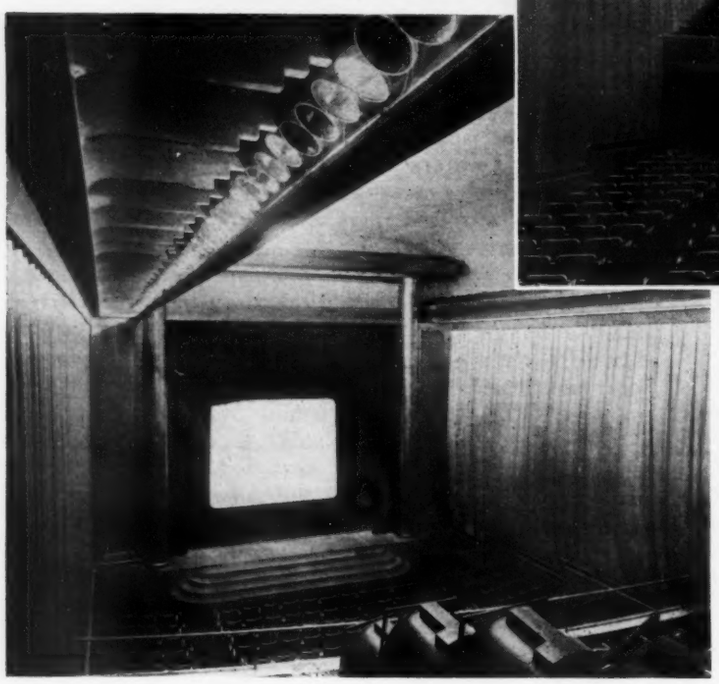
Novel Lighting in Paris Cinema

The small hall of the Cinema de Miracles at 100 Rue Reamur, an adjunct to the office of the newspaper *L'Intransigeant,* shown in the accompanying illustration, is normally lighted from an indirect cove system placed above the rather broad shelf which extends around two sides and the rear of the room. During intermissions, however, lighting effects of an unusual nature are provided for the enjoyment of the audience. The side walls are hung with curtains of thin silk draped in simple folds. At the base between the fabric and the wall are a large number of small outlets through which compressed air is forced. This causes the entire wall to take on an undulating, shimmering motion. On this is superimposed changing colored light, red, yellow and blue, from projectors placed as illustrated beneath the overhanging cove. When this effect is finished and just before the picture starts a series of lantern slide projectors, which can be seen at the bottom of the view taken from the balcony, throw colored pictures on the two walls and proscenium curtains. These pictures are carefully worked out so that they are nicely overlapped, giving the effect of a continuous mural. If the motion picture to follow has its scene in the Sahara Desert the entire room is decorated with a scene of the sands, palm trees and oasis. If the scene of the picture is at the North Pole, for example, frozen wastes, Eskimo igloos and icebergs produce the desired setting. These views are changed for each film to create atmosphere.





The architect was Sardou, and the firm of Jacopozzi installed the lighting system.

Rural Extension Practices

By BEN H. NICHOLS*

Oregon State College, Corvallis, Ore.

Survey of plans and policies in 45 states.
Regulation rules of state commissions.
Financing plans and approvals.

FINANCING the large original investment per customer is one of the major problems of rural electrification. Plans and policies of utilities in 45 states reveal a wide variation in the methods employed in the construction and financing of rural distribution circuits. Ten of these states, as shown in Table I, have blanket regulations by public service commissions for all utilities operating within their borders. In these states the utility retains title to the lines built because of maintenance requirements, but in only six are the utilities required to pay all of the costs of such lines.

Alternative procedure consists of requiring the customer to guarantee a minimum monthly amount ranging from 2 to 2.75 per cent of the construction cost or permitting the customer to contribute cash, material or labor to reduce the minimum guarantee. In certain of these states the company must pay up to a certain percentage of the estimated annual revenue or pay a definite amount of cash per customer toward the construction costs. These regulations require the customer to pay all excess costs of the initial investment, being reimbursed by subsequent customers added over a five-year period to the line to an amount not exceeding that paid in.

Summarizing the trends in the regulation of this phase of utility operations, it may be said that commissions generally lean toward the procedure of requiring the utility to pay all of the costs of this construction, with the customer guaranteeing as a monthly return a certain percentage of that cost. Additions of subsequent customers to the original group acts to reduce the minimum guarantee through reapportionment. Where companies are not required to pay all of the costs the tendency is to require them to pay up to a certain percentage of the estimated annual revenue, using a multiplying factor of from 150 to 300 per cent. In such arrangements the customer deposits the balance of the construction cost, which is refunded to him annually.

Where regulatory bodies did not intervene plans varied from such extremes as the company paying all the costs to the customer paying all the costs, the title of the line remaining with the utility in both instances. In studying these results the same grouping was made as in the rate investigation* and the data are given in Table II.

Among the large companies, 35 of which submitted plans, only nine of the 27 state commissions represented required approval of rural line construction policies. Only thirteen of these companies pay all the costs, most of them requiring a guarantee of a minimum monthly revenue calculated to return the construction cost within a certain period, the shortest time being three years. Two companies in the South included an item in the rates separate from the usual charges to the effect of charging 25 cents per month per pole beyond existing lines. One Great Lakes utility required a deposit of $1,000 per mile before construction could be started, refunding $100 per customer after rendering the first bill.

Among companies which did not pay all of the cost of the line, the most favored method was to build a certain amount of line per customer, twelve of 22 companies adopting this procedure. Amounts varied from building 1,320 ft. of line along the highway per customer to building all the line along the highway. Several of the remaining companies elected to pay a given amount, ranging from $450 to as low as $150 per customer. Where customers were required to pay excess costs or to build lines, only three of the 22 companies allowed title to remain with the consumer. In addition five of these eighteen remaining utilities demanded a minimum monthly guarantee of revenue to protect the amount paid in by the company. Only two of these offered the minimum monthly guarantee as an option to paying all the costs. Refunds were made by only eleven of the 22 companies requiring customer aid in financing line construction. An extreme case is interesting. One utility required a five-year contract with the consumer in addition to demanding that consumer pay all excess costs over $400 per mile.

Policies of the medium-sized companies varied only in the amounts specified for construction and certain minor details of guarantees. Amounts advanced by the utility

Table I—Comparison of Public Service Commission Regulations for Financing the Construction of Rural Lines

Region	States with Blanket Regulations	Company Pays All Costs		Joint Participation in Construction Cost			
				Company Share		Customer Share	
		Customers Make a Deposit Which Is Refunded Annually	Customers Guarantee a Minimum Monthly Revenue	Pays a Given Amount of Cash per Customer	Pays a Percentage of Estimated Annual Return	Pays Excess Cost, Reimbursed by Subsequent Customers	Makes a Deposit Which Is Refunded Annually
Pacific Slope	3	..	1	2	3†	2	1
Mountain Plateau	1	1	..	..	..	..	..
Plains	0	..	..	..	..	..	..
Great Lakes	1	..	1*	..	..	..	..
South	2	..	1	..	1	1	..
Middle Atlantic	3	..	2*	..	1	..	1‡
North Atlantic	0	..	..	..	..	..	..
Total	10	1	5	2	5	3	2

*Customers may contribute cash, material or labor to reduce guarantee.
†Each of the three states offers this as an option to the regular plan.
‡Customer may elect to guarantee a minimum revenue.

From a thesis prepared by the author. See ELECTRICAL WORLD, *December 17, 1932, page 819, for a discussion of rates and returns.*

Table II—Comparison of Rural Extension Policies

Large Companies

Region	Number of States	States Requiring Approval by P.S.C	Number of Companies	Company Pays All Costs: Customer Makes a Deposit Which Is Refunded	Company Pays All Costs: Customer Guarantees a Minimum Monthly Revenue	Company Pays All Costs: Cost Included in a Separate Item of Rate	Joint Participation: Company Share: Builds Up to a Given Amount of Cash or a Given Amount of Line per Customer	Joint Participation: Company Share: Builds Up to a Percentage of Estimated Annual Return	Joint Participation: Customer Share: Customer Pays All Excess Costs	Joint Participation: Customer Share: Customer Guarantees a Minimum Revenue	Joint Participation: Customer Share: Customer Pays Given Amount per Foot of Excess Line	Joint Participation: Customer Share: Customer Advances Reimbursed
Pacific Slope	1	1	2	..	..	..	2	..	..	..	2	2
Mountain Plateau	2	..	2	..	2	..	..	..	..	..	..	..
Plains	7	2	9	..	3	..	6	..	5	2	1	..
Great Lakes	5	3	9	1	1	..	5	2	7	3	..	5
South	7	2	7	..	1	2	3	1	4	1	1	..
Middle Atlantic	3	..	4	..	1	..	3	..	2	1	..	2
North Atlantic	2	1	2	..	2	..	..	..	..	..	..	..
Totals	27	9	35	1	10*	2	19	3	18	7†	4	9

*Four of these permit the customer to contribute cash, material or labor to reduce guarantee.
†Two optional with, and five in addition to, paying all of the excess cost.

Medium Companies

Region	Number of States	States Requiring Approval by P.S.C.	Number of Companies	Company Pays All Costs: Customer Makes a Deposit Which Is Refunded	Company Pays All Costs: Customer Guarantees a Minimum Monthly Revenue	Joint Participation: Company Share: Builds Up to a Given Amount of Cash or a Given Amount of Line per Customer	Joint Participation: Company Share: Builds Up to a Percentage of Estimated Annual Return	Joint Participation: Customer Share: Customer Pays All Excess Cost	Joint Participation: Customer Share: Customer Guarantees a Minimum Revenue	Joint Participation: Customer Share: Customer Makes a Deposit	Joint Participation: Customer Share: Customer Required to Buy a Given Amount of Equipment	Joint Participation: Customer Share: Customer Advances Reimbursed
Pacific Slope	1	1	1	..	..	1	..	..	..	1	..	1
Mountain Plateau	4	..	5	1	1	1	1	2	1	..	..	1
Plains	3	1	3	..	..	2	..	2†	..	..	1	2
Great Lakes	3	2	3	1	..	2	..	1	1	..	..	1
South	3	..	3	..	2	1	..	1	..	..	..	..
Middle Atlantic	2	..	2	..	1	1	..	..	..	1	..	..
North Atlantic	3	3	3	..	2	1	..	1	..	..	..	..
Totals	19	7	20	2	6*	9	1	7	2	2	1	6

*Three of these permit the customer to contribute cash, material or labor to reduce the guarantee.
†One company requires the customer to build and own line.

for line construction varied from $200 to $400 per mile. In cases where prospective load was a criterion of the amount of line construction, several companies built all the line along the highway. One would build up to 2,000 ft. single phase per customer, other amounts varying with the locality and utility under consideration. The small companies have almost identical provisions as regards new construction as the other groups.

In comparing these policies outstanding differences will be noted between geographical areas rather than between company grouping. On the Pacific Slope considerable regulation is exercised by public service commissions. In that area most commissions favor some contributions by both the utility and the farmer, the former either building a certain amount of line, paying a given amount per customer or investing a certain percentage (usually 300 per cent) of the estimated annual revenue. Excess costs are provided by the consumer.

In the Mountain plateau regulation was less in evidence, only one state employing such measures. There the company pays all the costs of new construction, being safeguarded by a customer deposit, which is refunded annually. One state in this area required the customer to pay all the costs in excess of the annual estimated revenue, title remaining with the customer. The remaining utilities favored the policy of paying all the costs, with a minimum monthly guarantee from the consumer.

A similar situation exists in the Plains area, regulatory approval being required in two states and the remaining allowing the utility to build a certain percentage of the line. Here a few companies required subsequent customers to reimburse original contributors to the excess construction costs on a proportional basis.

The Great Lakes region has specific regulation on the financing of rural lines in a majority of states. There again the company builds a certain percentage of the line on one of several plans already discussed, excess costs being advanced by the customer and refunded by various methods. Some companies require a guarantee in addition to protect their investment.

Regulation in the South exists only in the Atlantic seaboard states. Opinion as to the methods used was evenly divided both in the two states having some regulation and in the other ten utilities reporting. Half of each group required the company to pay all the costs, with a minimum guarantee of monthly revenue. Two states substituted a monthly service charge for the guarantee. Where the entire cost was not carried by the utility, the

plan of the utility building so many feet of line or paying so much per customer was preferred to that of the customer paying the excess without refund. In the Middle Atlantic group unregulated utilities followed plans similar to those discussed for other sections. In the three regulated states two required the utility to pay all costs with a minimum guarantee of monthly revenue, with the option of customers furnishing labor, materials or cash to reduce the guarantee. In the third the utility was required to build up to 300 per cent of the estimated annual revenue with a deposit refunded annually to care for excess costs, customers having an option of guaranteeing a minimum return and placing the entire burden of construction costs on the company.

In the North Atlantic group there is little regulation, the preferred method in that area being to have the utility pay all the costs with a minimum monthly guarantee.

Summing up the tabulation, in 35 states where blanket regulations are not in effect only eleven states require approval of rural extension plans. In the 35 states, 60 financing plans were available to the utilities, 22 of which pay all the costs of the line with a minimum monthly guarantee of revenue. Of the 36 companies paying only part costs, fifteen would build up to a given amount of money per customer, seventeen build so much line per customer and four build to a certain percentage of the annual revenue. A majority require the consumers to pay all excess costs. Where refunds were specified they never exceeded the amount paid in, reimbursements being made annually or when new customers were added.

Authorities questioned regarding the advisability of requiring customers to pay excess costs were in unanimous agreement that this practice was detrimental to increased use. The principal reason advanced was that it left the farmer with no funds with which to purchase equipment, although some questioned the justice of customers being required to build a line and then give it to the utility.

Closely associated with this practice of advance payments for distribution lines is the question of financing wiring and appliances on the farm itself. It has been suggested that the high first cost of the utilization of electricity greatly retards its application for rural use and that some scheme of partial payment for both line financing and power-consuming appliances would help to solve this difficulty.

In considering the general problem of financing rural lines, the author ventures the opinion that it is far better for the utility to pay all the costs of such construction up to the customer's meter, retaining as its protection a contract for a definite period of years. Individual farmers should be allowed to contribute such materials, labor and cash as may be possible to reduce the guarantee. This arrangement relieves the farmer of the original outlay to obtain power and allows him to invest that money in current-consuming and labor-saving devices. In this manner the farmer can realize an immediate profit on his investment, which will encourage greater use of energy, with the consequent lower unit cost to the consumer and increased profit for the utility.

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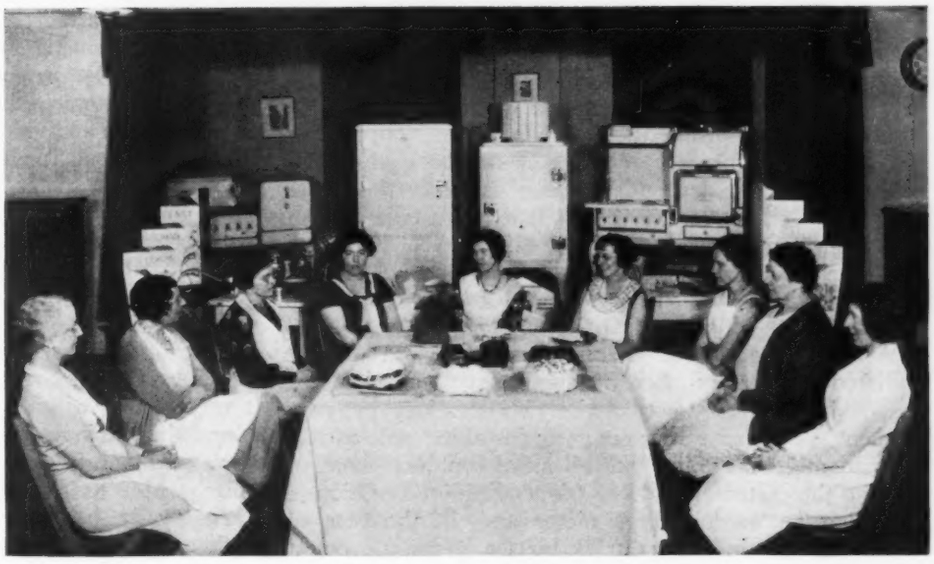
Teaching Electric Cookery by Laboratory Method



About a year and a half ago the home service department of the Public Service Company of New Hampshire started developing the laboratory method of cookery promotion by the use of group cooking classes, and after eighteen months of successful operation it feels that this plan has proved to be a very effective piece of promotional work. The method used in organizing these classes is that the home service worker contacts some woman of influence in her community or neighborhood and invites her to organize a class of not less than six nor more than eight of her friends who would like to devote one afternoon or evening a week for ten weeks to the study of electrical cookery under a trained instructor in a model kitchen. The response has been such that no aggressive policy of class organizing has been necessary, as there is a waiting list of women.

The course for each class consists of a definitely arranged schedule of eight lessons, in which different types of electrical cookery are taken up in detail. The instructions are given in school laboratory style. Each student is given the recipe she is to prepare, together with the ingredients and equipment to work with, and shares her proportionate part of the cost of the ingredients, usually from 25 to 50 cents; in return she is given the food which she cooks to take home. She actually uses the range and the other electrical appliances which are furnished and prepares the food from start to finish. She is impressed with the convenience, speed, comfort and cleanliness of electrical housekeeping.

Reducing Energy Diversion

By MALCOLM T. McKENZIE
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Inspection advocated.
Cautions to employees.
Meeting the psychology of customers.
Avoid legal battles.
Suggested records and preventive measures.

INSPECTORS should make a house-to-house canvass to get an accurate knowledge of energy diversion conditions in any community. These inspections would note all conditions and character of the services, such as bus service in rear of buildings, multiple services, aerial taps, condition of house wiring including open or conduit entrances, open cabinet or meter trim, switch, etc. Inspectors should make out complete record cards for all customers. These cards should show all service conditions and, in addition, the nameplate data of meters for each service and they should be kept as a permanent record.

This record can be used in many ways. For instance, if the company needs a particular type of meter, say bottom feed or top feed, it can readily be located and changed, houses not wired can be located easily; in fact, almost any kind of service survey can be made directly from the cards once the file is complete. This file should be separate and distinct from a suspect file. Of course, once this inspection has been started sufficient inspectors should be kept on it to cover the territory about once a year.

In districts where it is thought that energy diversion is prevalent it is desirable that the amount of energy so lost be known before formulating prevention. To find this value the installation of meters to measure all of the energy fed into the secondary feeders by the transformer is a good method. This meter can be installed in a box on a transformer pole and a line order should be issued for it, showing the house numbers fed by this particular transformer. The meter can be read by the regular meter reader on the same day that the house meters are read. It is essential that on installations of this kind transformer, meter and billing records be tied in to facilitate accounting. Pole meters installed directly on the service of the suspected customer is another good way to find the exact value of energy diverted.

After evaluating the energy diverted reform can be initiated from a number of angles, such as changing three-wire meters to two-wire, six-terminal or two-element, as the case may suggest; installing pole meters permanently, installing an all-metal outdoor box or forcing the customer to do so (depending on conditions), installing an outdoor type meter and, in the case of tenement, apartment or duplex houses, grouping meters in an all-metal outdoor box with iron-clad service to and from it, eliminating the so-called bus service and installing poles enough to afford an individual service to each customer.

All information, giving names and locations where energy diversion is practiced, can be directed to the meter department or to a special department, as the case may be, in a number of ways, though in general a good plan is to have all contact men—trouble shooters, meter readers, installers and testers—report the data to their immediate superior, who in turn directs the leads to the proper department or person for investigation.

Some companies pay bonuses for "leads" in amounts ranging from 50 cents to $5. No doubt this practice will bring in many tips, but it is open to serious question as it not only tends to corrupt the employee—that is, inviting him to turn in false information—but openly questions his loyalty, as there can be no doubt as to what course he should follow if he has knowledge of energy diversion. The writer's experience has been that there is never a lack of leads once the men are instructed; in fact, this phase of the work is easiest of all. Paying bonuses will also seriously detract from the company's case in event of a law suit.

Reporting practices suggested

The billing department sends notice of non-registration or unusually high registration to the meter department for investigation as a matter of routine. To these should be added erratic registrations as they are fruitful of results. The meter department, after investigation, can either place the suspects in a special group for further treatment or pass them on to a special department, depending on individual organizations. Conditions that contact men can report are the following: Service left "hot" with no meter, meter loop closed, fuses bridged, meter or box unsealed, meter found jumped, evidence of energy diversion such as switch jaws spread, switch blades scratched or scraped bright, fuses out, switch out, part of load connected ahead of meter, meter stopped, defective wiring, "hot" wire through bar on meter, etc.

The organization for the investigation of leads will depend on the size of the community served. Specialization probably will be justified only in large companies. Generally the investigation of energy diversion should be directed by an individual of mature judgment and astute mind. Men used as investigators should be selected for their loyalty, honesty and perspicacity; they should have a thorough knowledge of wiring and metering conditions and be familiar with company operations.

A working knowledge of human nature and a modicum of horse sense are essential in dealing with the problem and, due to its intimate connection with public relations, tact takes its place as the priceless ingredient. The consumer who is backing out one fuse of a three-wire cut-out to stop the meter will reform as soon as his meter is changed to a type that will not stop when a fuse is loosened. Why? Because he feels that you have a line on him and the very threat of the stigma brings him up

short. At the opposite extreme is the fellow who regards the thing as a game, a sort of hide-and-seek proposition. As soon as you stop him one way he seeks another, and so on until he brings up against something solid.

To illustrate this, the writer once encountered a case as follows: The occupants of a house were found to be obtaining energy by dropping a line out of an upper story window to the company's lines. The lines were put in conduit and made solid by the company. The occupants then went down to the company office and arranged for service, furnishing the required deposit. A few days later an inspector was sent to see if all was well; he gained admittance after minor difficulty to find that the seals had been broken on the meter trim switch. He resealed the switch and warned the customer that, in the event of a reoccurrence service would be discontinued. After a lapse of several days the inspector again visited the place and after considerable delay and much persistence was admitted, this time to find a section about four inches long and half the pipe diameter sawed out of the conduit in the bathroom before it got to the switch. The service was discontinued at this place and the customer was told that service could be obtained only if he had an outdoor meter box installed and a conduit service run to the company's lines.

Thus it would appear that there are two principal classes into which offenders fall. We always have with us a few consumers practicing diversion who are innocent of intent to defraud. These are the consumers who trustingly buy from the itinerant peddler jumpers in various guises, such as so-called energy conservers, the most common being an arrangement whereby one side of the house wiring is grounded, one fuse backed out (on the ground side) and the connection at the switch changed so as to connect the "hot" wire through the bar of the two-wire meter.

Cautions to employees

All employees connected with this work should be cautioned against stating or accepting anything but pertinent facts, avoiding anything redolent of gossip or scandal-mongering.

Inspectors should make their reports in writing on a standardized form, givinig the usual meter data, number and reading, a summary of irregular conditions, such as open switch and wiring, individual service, detained at door, heard radio go off and on again, found drop with two-light attachment near meter swinging. Possibly the report would read as follows: Conduit entrance, meter trim switch, bus service, seals missing from switch.

Two men visiting suspected places at night, between the hours of 7 and 9 p.m., when making routine voltage tests can accomplish a great deal as they usually catch the jumper on or see the lights go off and on while awaiting admittance. The principal reason for having two go together is to have more than one eye witness.

It is thought that legal action, due to its repercussions in counter suits and undermined public relations, should be resorted to only in exceptional cases, such as those in which persons who make a business of selling jumpers and other means of energy diversion are involved. In handling these cases it might be well to secure the services of a reliable investigating service so as to be sure that sufficient evidence and affidavits are obtained to secure conviction before involving the district attorney and also to keep the company's employees out of the limelight of publicity.

In the ordinary case, even if the company wins, it loses, for what is gained in damages is lost in good will. It is only natural that public sympathy be with the little fellow. However, if the company operates in a locality where legal redress is comparatively easy and thought necessary, its *modus operandi* will differ somewhat from that of the company to which this recourse is not advisable. Where legal action is decided upon no work should be done until a thorough understanding is had with the company's legal department and a definite procedure is laid out.

Law cases to be avoided

Legal entanglement, growing out of misdirected activity, is likely to be very expensive, not to mention impaired contact relations. The word slander and the phrase defamation of character are indeed potent; likewise, malicious prosecution, unlawful entry and false arrest. No contact employee should be ignorant of their meaning. In dealing with consumers regarding energy diversion, all of the negotiations shall be oral and in privacy, never in writing. A consumers' service should never be discontinued because of energy diversion without positive proof.

In the light of present experience, it appears that the best way to handle cases where jumpers are found and sufficient proof is had is to discontinue the consumer's service, telling him that he must go to the office and see a certain individual about requirements before he can obtain service again. This individual is one versed in the work and will adjust the case along lines based on the proposition that it is not enough merely to collect an estimated amount to compensate for energy diverted, but that something should be done to make it difficult or highly impractical to practice diversion again.

Co-operation of the city or the local electrical inspector can be very helpful in handling some cases such as those where the National Electrical Code or local ordinance has been violated.

The all-metal outdoor box and the outdoor meter are the two most effective means of preventing energy diversion and all new wiring should include one or the other or, if not all new wiring, at least all new wiring in suburban districts.

Some advantages of the outdoor job are as follows: Meter readers, testers and maintenance men do not have to make "call-backs" due to customers' absence from home, no need to disturb the privacy of the home to make readings, tests, etc., service can be easily disconnected at any time with a minimum of effort, the customer is not likely to tamper with meters on the outside of the house and in some instances in full view of passersby; if seals are broken the consumer has no valid excuse as there are no fuses or any reasonable pretext for going into the outdoor box or meter, and in both cases meters can be read without touching.

There has been much talk to the effect that the company should furnish boxes for outdoor installation because the company would then have the legal right to forbid breaking of seals, but in the light of past experience this advantage would appear to be a doubtful one. However, there can be no question in the minds of progressive executives as to which way the course lies.

New Pump Increases Advantages

In four months' experience with first "Rannett" outdoor unit in regular service better than expected performance is attained.

New type of electric power rate also proves satisfactory.

CALCULATIONS showed that a capacity increase of 45 per cent could be expected by the Great Lakes Pipe Line Company in its gasoline pipe line when a certain new type of pumping unit went into operation as a booster, or secondary pump, in the line October 1, 1932, at Paradise, Mo. This does not prove quite correct, for the line was estimated to carry 1,500 bbl. of gasoline per hour with the new unit working. Actually the capacity was increased nearly to 1,600 bbl., one test showing 1,595.12. According to F. E. Richardson, general superintendent of the company, who kindly furnished the information on which this article was written, the increase of nearly a hundred barrels per hour of actual over-estimated performance is due to two things. One is the reduced pipe friction encountered by the continuous flow from a centrifugal as compared with the pulsing flow from a reciprocating pump. The other reason appears paradoxical, since it is based on the presence of a slight obstruction in the pipe line some distance away from the suction side of the new pump. The effect of this obstruction is to reduce the intake pressure and thus work the pump at a somewhat greater head than was calculated. The characteristic performance curve of a centrifugal pump is a rise and fall of efficiency as pressure head increases. If the operating locus of the pump is on the rising side of the curve an increase of head causes an increase of efficiency, and thus, apparently, is the condition in this particular case. The peculiar adaptability of motor drive to the centrifugal pump makes these two unlooked-for bits of lagniappe special attributes of electric power in pipe line pumping.

But before enlarging any more on the performance of this installation let us get a picture of what it is. A couple of years ago D. J. Moran and E. O. Bennett, president and chief engineer of the Continental Oil Company, undertook to develop an economical, compact pipe line pumping unit that could be installed out of doors, would require the minimum of operating labor and could, if conditions required, be moved easily from one location to another. The results of their labors appear in the "Rannett" pump installation which is the subject of this article. The unit is shown in the accompanying picture and details of its design and operation are exposed in the cross-section plate and caption with it. Briefly the unit consists of a totally inclosed 700-hp., 2,300-volt, 3,600-r.p.m. induction motor coupled direct to an eight-stage, 800-lb. discharge centrifugal pump. The specially novel feature is the cooling of the motor by circulation of the entire flow of the pipe line through the double-walled stator housing, thus obviating any need for motor ventilation and very considerably reducing the windage losses. The motor and pump were built by the Allis-Chalmers Manufacturing Company as an integral unit, which weighs about 14 tons, transportable on a motor truck.

The purpose of the installation at Paradise was to prove or to disprove by operation the proposition that increased pipe line capacity could be obtained by accelerating the flow in an existing line by means of a booster located between primary pumping stations at about one-tenth what it would cost to secure equal added capacity by laying a parallel line. Also, it was desired to test out the new unit and at the same time secure basic pipe line operating data. Another purpose was to find out by actual experience whether or not an outdoor pumping station was really practicable, whether or not the usual investment for buildings could be saved. From the information supplied by Mr. Richardson it appears that the installation has proved itself in these respects.

Station 5 A, as the Rannett pump is designated in the pipe line, is located 121,000 ft. north of a primary pumping station at Kansas City and 128,000 ft. south of another primary station at Osborn, Mo., approximately midway between the two. It is intended later to install

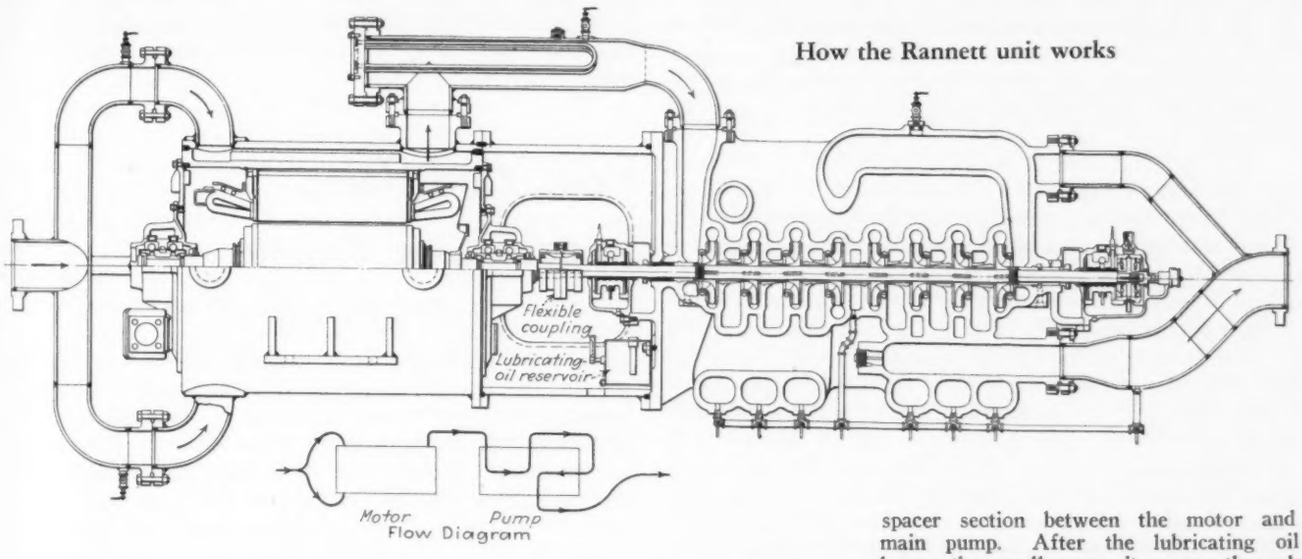
# of Electric Power for Pipe Lines

remote-control equipment to operate the pump from Kansas City, about 24 miles away. The only building on the lot is a small steel house containing switches and control equipment. Energy is supplied from the system of the St. Joseph Railway, Light, Heat & Power Company at 22,000 volts and stepped down in a bank of three 200-kva. transformers. Two very comprehensive tests have been made on the unit since it was put into operation. A résumé of data from one of these is presented in the accompanying tabulation. In this test a maximum fifteen-minute demand of 500 kw. (not shown in the table) was recorded on the primary side of the transformers, while gasoline was being pumped at a rate of a little over 1,590 bbl. per hour.

Asked what operating troubles had been encountered, Mr. Richardson stated that the only difficulty with the unit itself was the necessity to change the size of the lubricating line to the thrust bearing and the only electrical trouble was the failure of the power line one morning when the temperature was twenty below zero. "In justice to the power company," said Mr. Richardson, "I should point out that the line was built new to the installation for a distance of 18 miles in about twelve days. We believe this one failure to be all we need expect, for any faults in construction would certainly have shown up by this time."

The installation is served on a novel type of electric rate, which was explained in some detail in ELECTRICAL

How the Rannett unit works



The unit consists of a 700-hp., three-phase, two-pole, 2,300-volt, 3,600-r.p.m. induction motor direct connected to an eight-stage centrifugal pump. The motor has its stator laminations inserted in a double-walled housing. The inner housing is made from a pierced forged steel billet and is seamless. The outer housing is made up of heavy welded sheets. The end plates and bearings of the motor are carried by bolts against the double-walled stator housing in such a manner that the rotor and bearings can be removed without opening the space between the double shell.

In operation, the fluid being pumped enters the double-walled section of the motor from the pipe line, which is in line with the shafts of the unit. The inlet to the motor is at the top and bottom of the unit at the outboard end. This arrangement provides access to the outer motor bearing. After the fluid in the pipe line flows spirally and laterally around the motor, it leaves at the top on the inner end, over the spacer section between the pump and motor to the pump intake. There is no pressure in the spacer section, it being vented to atmosphere through finely screened louvers. The inside bearings of the motor and pump, between which is a "Fast" flexible coupling, are inside the spacer section. In the bottom of the spacer section there is an oil reservoir, which holds approximately 40 gal. of lubricating oil.

The pump is an eight-stage unit with two sets of impellers of four stages in opposed arrangement to equalize end thrust and to take the high-pressure discharge from the center of the pump between the sets of impellers. The flow through the pump is from the inside or motor end through the first four stakes in series, out the top of the pump to the outboard end, through the second series of four impellers toward the center of the pump. The discharge is parallel to the axis of the pump and is carried inside the loops between stages for compactness. The loops between stages are below the center of the pump and the discharge pipe is carried upward at an angle to the center line of the unit.

At the outer end of the pump shaft there is installed a small gear type pump with a capacity of approximately 4 gal. per minute. This pump takes its suction from the lubricating oil in the lower half of the spacer section between the motor and main pump. After the lubricating oil leaves the small pump it passes through a heat exchanger located in the main fluid line between the motor and pump. The heat exchanger is made of steel tubing and contains 60 ft. of cooling surface. From the heat exchanger the oil is carried through a manifold to all motor and pump bearings. All bearings are of the sleeve type, with the exception of the Kingsbury thrust bearing.

Any small amount of leakage which may occur at the suction or intermediate stage packings of the pump is carried by gravity through a conductor system to a 1,000-gal. tank. The tank is fitted with two floats operating mercoid contactors. When the fluid level reaches the lower float the mercoid contactor starts a 5-hp., 220-volt motor direct connected to a pump. This pump takes its suction from the 1,000-gal. tank and discharges it into the main pump suction. It has an effective head suitable for pumping out the 1,000-gal. tank against a main line pressure of 40 lb. should it ever be necessary to empty the tank when the centrifugal pump is idle. A second mercoid operates a relay and cuts the main pump off the line in the event of failure of the small pump, thereby preventing any loss of pipe line fluid.

Test on 5-A Rannett Pumping Unit, Great Lakes Pipe Line Company*

	Station No. 5									Station No. 5-A Motor						Station No. 6	
										Station Meters†			Test Meters†				
Time	Net Bbl. Pumped	Manifold Gage Pressure, Lb./Sq.In.	Pump Line Pressure, Lb./Sq.In.	Pump Suction Pressure, Lb./Sq.In.	Pump Discharge Pressure, Lb./Sq.In.	Line Discharge Pressure, Lb./Sq.In.	Temp. Incoming, Deg. F.	Temp. Outgoing, Deg. F.	Pump R.P.M.	Kw.	Volts	Amperes	Kw.	Volts (Actual)	Amperes (Actual)	Net Bbl. Received	Manifold Gage Pressure, Lb./Sq.In.
11:30	1,595.12	875	32	25	800	800	58	62	3,565	499.5	2,290	138	484	2,250	135	1,586.83	10.25
12:30	1,590.31	875	31	24	805	800	58	62	3,565	499	2,300	138	486	2,276	134	1,684.35	10.75
1:30	1,569.28	865	31	23	802	800	58	62	3,560	499	2,290	138	486	2,240	134	1,489.32	11.5
2:30	1,592.47	860	26	17	798	795	58	62	3,560	494	2,290	138	482	2,246	134	1,595.70	12.0
3:30	1,590.37	860	30	22	802	800	58	62	3,560	496	2,300	137	482	2,260	134	1,604.57	12.5
Average values	1,587.5	867	29.5	21.5	801	799	58	61.9	3,562	498	2,292	137.7	485	2,252	135	1,292.15	11.1

* Test readings were taken at fifteen-minute intervals from 10:30 a.m. to 3:30 p.m., but only hourly readings are reproduced here.

† Station meters are on primary side of supply transformers and test meters were connected on secondary side. Hence the difference between readings.

WORLD for December 24, 1932, page 838. Briefly, this rate consists of a charge per kilowatt of demand assumed to be used 8,760 hours per year. As use falls below this 100 per cent annual load factor the customer is credited for the kilowatt-hours not used at the increment cost of delivered energy.

Mr. Richardson was asked how he, as a pipe line operator, liked this type of rate after his experience with it. He said:

"It is the first rate of its kind under which we have operated and we are very well pleased with it. It follows very closely the charges that can be expected from a Diesel station. For instance, the load factor credit for power unconsumed allows the kilowatt-hour curve to coincide with a Diesel energy curve of a capacity equal to the electrical unit. For a single unit station the yearly demand feature of the rate is satisfactory, but for a station with two or more units some revision of this factor would probably be necessary. However, as a class, secondary stations require only one pump, because with the secondary station not in use the pipe line will have about two-thirds of the capacity possible with the secondary station working. This condition will, as a rule, give the pipe line an adequate operating flexibility. Thus a secondary station, when it runs, operates at full capacity, and for this reason its full capacity can be installed in a single unit and the resultant economy in investment cost can be realized. Unless a pipe line is completely shut down or its capacity only partially utilized for a considerable period, it can be assumed that a secondary station will run some time in each month of the year. This justifies the yearly demand which is favored by many power companies and which is of distinct benefit to the customer.

"It may be interesting to note that most pipe line companies feel that the electric utilities overlook the possibilities of the pipe line pumping load. The feeling is that the utilities do not recognize what the pipe liner believes to be certain superiorities of the pumping load over loads in other industries, even those of equally good load factors. I have in mind that a 50 per cent load factor in a pipe line service quite often means fifteen consecutive 24-hour days in a month, whereas in another industry the same load factor may mean operation at twelve hours per day, including the utility system peak periods and allowing no opportunity for use of off-peak energy.

"Also, it should be interesting to the utilities to know just how much energy the Great Lakes Pipe Line Company would use if its system were entirely electrified—20,000,000 kw.-hr. per year. It certainly seems to me that this total possible use of electricity or any significant portion of it should justify the power companies in a considerable effort to analyze the pipe line load and to fit it into their program for development of their business."

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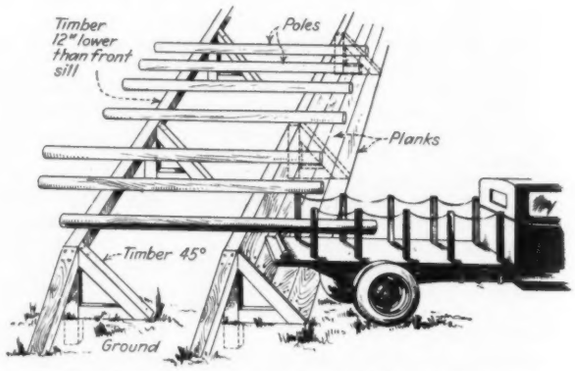
Pole Yard Ramp Speeds Line Repairs

By GUY F. HARDEN

To avoid wasting time in getting poles out of storage during emergencies a ramp built of planking has been found useful. A trestle structure is provided in which one rack is 1 ft. higher than the other to permit line trucks to be backed into position quickly under the projecting pole butt, the surface on the truck side making



Inclined rack serves truck quickly in pole yard

a 45-deg. angle with the horizontal so that the end of the pole can be dragged down the slide without danger of breakage or tearing away the lashing to the truck. After lashing to the truck the pole is slowly drawn forward, slid down and fastened to a trailer. A number of different sizes of poles in first class condition are carried on the trestle storage for emergency service only, and the arrangement is useful in snowy weather as well as in clear periods.

Electrochemical Processes Increasing

By COLIN G. FINK*
Head Division of Electrochemistry, Columbia University

New developments, when far reaching enough, have been the basis for previous prosperity eras. Is it possible that the developments and future possibilities in electrochemistry and metallurgy may collectively open up new opportunities for a spurt ahead? Ability to produce hitherto costly products for less money or make products with new qualities or better combinations of qualities could bring into being new businesses and industries which have not been economically feasible before.

But there is another reason why electrochemical and electrometallurgical processes should be followed by industrial and utility men. In the short space of ten to fifteen years they have assumed an ever-increasing proportion of the total power requirements throughout the world. If the advantages of electric processes and the benefits of using the products are made more widely known, who is to say they may not dominate the power requirements of the future and increase the value placed on electrical engineers?

FIFTY years ago there was no electrochemical industry, and today the industry has spread all over the world with a wide diversity of products approximating an annual value of a billion dollars. Within the last ten years there has been an increase in output of electrochemical products of almost 200 per cent—10,000,000 tons today, as against 3,500,000 tons ten years ago.

Fused Electrolytes—Taking the figures for the last normal year, 1929, we find that the electrical energy consumed by the world's 300,000 tons of aluminum amounted to nearly 7,000,000,000 kw.-hr.

The keynote of the coming new era will be the large number of new products and devices. Among the metals, the one metal to enter the widest variety of new fields will be aluminum—aluminum for railway equipment, aluminum for roofs and buildings, for food containers, for transmission, for airplanes, for tank cars, pipe lines, fencing, etc. Finally, we should mention briefly the new aluminum plate, superior to tinplate in many respects, developed at the electrochemical laboratories at Columbia. There is every indication that by 1942 the world's output of aluminum will total 600,000 tons—equivalent in volume to the world's production of copper in 1929. The electric power requirements to operate the aluminum cells to turn out these 600,000 tons will amount to more than 14,000,000,000 kw.-hr., and to this figure should be added the electric power consumed in the operation of the rolling mills for the production of sheet and rod and power for the furnaces for the manufacture of aluminum alloys.

Whereas the supply of raw material for many of our metals is comparatively limited in years, the supply of bauxite or aluminum ore is almost limitless. Thus, for example, whereas copper at the 1929 rate of consumption will last but 40 or 45 years, the aluminum ore reserves will satisfy our demands for many hundred years.

Aluminum is produced by the fused electrolyte process, the same basic process that is responsible for a host of other metals; most important among these is magnesium. Magnesium is 30 per cent lighter than aluminum. The electric power consumption in the manufacture of magnesium is approximately the same as for aluminum, pound for pound.

The Dow Chemical Company, the largest producer of magnesium metal in this country, reports that "magnesium alloys" are now fulfilling the many predictions made regarding them. The transportation industries continue to be their largest users. Aircraft applications are increasing, both in number and volume, and now include parts made from sheet and structural sections, as well as motor, wheel and miscellaneous castings. Sheet for structural sections is finding still wider use in bus, truck and trailer construction. Several large manufacturers of portable tools and equipment are finding satisfaction in the use of magnesium alloys. Particularly interesting is their application in foundry flask, pattern and core box construction, where lightness, ease of finish and ease of parting from sand are important. Bread peels constitute an application in the baking industry. They are both lighter and much longer-lived than the older wooden peels.

It is only a comparatively few years ago when aluminum, magnesium and sodium were the only three metals produced on a large scale by the fused electrolyte method. Today there is a very important list comprising lithium, beryllium, barium, calcium, cæsium and others. The greatest impetus to the fused electrolyte industry has been the progress in aeronautics. Most of the newcomers in the light-metal group are today used as small additions to aluminum and magnesium.

It was one of the world's largest electrical manufacturers, the Siemens & Halske Company, that appreciated the commercial possibilities of the very light metal, beryllium, for aircraft construction. This company has carried out a very well-laid-out program of research and has already achieved some remarkable results. In this country H. S. Cooper of Cleveland has developed an efficient fused salt bath process, and there is every indication that the present high manufacturing costs will be very materially reduced in the near future. Beryllium is four times as elastic as aluminum and 25 per cent more elastic than steel. Pure beryllium is ductile. It is seventeen times more transparent to X-rays than aluminum. The addition of 4 per cent of beryllium to copper increases its hardness sevenfold.

Another newcomer in the fused-salt product group

*Based on address before A.I.E.E.

is lithium, the lightest of all metals, less than one-fifth the weight of aluminum. The Allied Process Corporation of New York is now manufacturing this metal on a commercial scale. A few tenths of 1 per cent of lithium added to aluminum ("skleron") develops properties in this metal similar to those of steel. Those intimately connected with the development of the lithium metal and alloy industry are fully confident of its rapidly increasing growth. Its present price is $15 per pound, which is not high when we compare it with the early prices for aluminum.

Aside from the many new metal, or cathode, products of the fused electrolyte industry, there is an important commercially new anode product, fluorine, which is used as a reagent in the production of various organic chemicals.

Aqueous Electrolytes—The increase in electrolytic copper plants during the last half dozen years has been most phenomenal. During the last ten years a very large proportion of the electrolytic copper produced has been from leach liquors. The voltage of the electrowinning cells is tenfold that of the electrolytic refining cells. Accordingly, during the last dozen years there has been a marked increase in the consumption of electricity by the copper industry, not only due to a doubling of the total output of copper, but due to the introduction of a new electrolytic copper process, the direct recovery from leaching solutions, necessitating a tenfold rise in voltage.

The case of electrolytic zinc is even more interesting. Commercial production of electrolytic zinc started during the Great War. In 1929 almost 500,000 tons of electrolytic zinc were produced from plants located in every part of the world with a consumption of 1,500,000,000 kw.-hr., or more than twice the electrical energy consumed for the world's output of copper in 1929.

Electrolytic cadmium is a by-product of electrolytic zinc. In 1919 the United States produced 100,000 lb. of cadmium; in 1929, 2,500,000 lb. Many electrical fittings are nowadays cadmium-plated, an assurance against corrosion.

With the marked reduction in voltage of the new electrolytic cells the direct production of pipe by electrolytic means is now cheaper than the furnace product.

Electroplating—The plating industry of today consumes more than 1,000 kw.-hr. for every kilowatt-hour consumed ten years ago. And not only is electrical energy consumed in the deposition of the plate, but appreciable quantities of energy are consumed in the electrolytic cleaning of the articles before plating. A recent interesting, large-scale innovation is the complete electric cleaning, plating and electric annealing of strip steel before stamping and spinning, doing away with most of the former individual racking and handling. Iu 1919 there was no chromium plating industry and today it has spread all over the world.

Alkali and Chlorine—Today more than 30 per cent of the world's caustic is made electrically, consuming 1.3 kw.-hr. for every pound produced, or more than 1,000,000,000 kw.-hr. for the world's output in 1929. Electrolytic chlorine has started an entirely new solvent industry and a new process for the recovery of metals from their ores.

Among the newer aqueous electrolyte processes we should include the production of white lead for paints,

Energy Consumption by a Few Electrochemical Industries

World Output

Product	Tons Produced in		Thousands of Kw.-Hr. Consumed in	
	1919	1929	1919	1929
Aluminum	150,000	300,000	3,700,000	7,000,000
Copper (electrolytic)	900,000	1,800,000	250,000	600,000
Zinc (electrolytic)	70,000	500,000	240,000	1,500,000
Caustic and chlorine	150,000	400,000	400,000	1,040,000
Calcium carbide	900,000	1,600,000	2,520,000	4,160,000
Electric steel	800,000	2,200,000	480,000	1,100,000
Ferro-alloys	220,000	550,000	1,320,000	3,000,000
Abrasives*	50,000	150,000	280,000	750,000
Total of products listed	3,240,000	7,500,000	9,190,000	19,150,000
Estimated grand total	3,500,000	10,000,000	10,000,000	21,000,000

In the "grand total" are included carbon and graphite electrodes electrolytic, nickel, chromium, lead, silver, gold and cadmium; also magnesium, sodium, tungsten, molybdenum, quartz, phosphorus, carbon bisulfide, cyanides, oxygen, hydrogen and miscellaneous other products.

* Silicon carbide and artificial emery (corundum).

better than the product by the old, messy, chemical method. The Anaconda Company at East Chicago has turned out many hundred tons of white lead according to the electrolytic process invented by the late Elmer Sperry of gyroscope fame. Another aqueous product is electrolytic rubber. The process is based on the fact that colloidal rubber particles will migrate to the anode by electro-osmosis or anaphoresis. Millions of rubber articles have been made by this "anode" process.

Electric Furnace and Its Products—Among the electrochemical industries the calcium carbide industry is undoubtedly one of the largest consumers of electrical energy, with the combined ferro-alloy and electric steel industries a close second. Calcium cyanamide, an important by-product and at one time the cheapest source of fixed air nitrogen, is today the raw material for practically all of the cyanide used in gold mining. From this cyanide, in turn, hydrocyanic acid gas is derived, now employed on a very large scale as an insecticide and vermin destroyer. Our citrus groves could not get along without this calcium carbide by-product. Another series of by-products developed on a large scale during the last ten years includes the chloride derivatives of acetylene, among which trichlor-ethylene has become a very important solvent.

The original carbide industry has today grown to a far-reaching chemical industry with a hundred-odd by-products, to which new ones are being added every year. Much of the vinegar we consume at our table today is a carbide by-product.

The electric steel industry has likewise had a phenomenal growth. In 1909 there were a dozen or so electric steel furnaces operating in various parts of the world. Today there are more than 1,200. And many of the new alloy steels—such, for example, as the high chrome steels—cannot be made in any other but the electric way. With the electric furnace and its controlled atmosphere, its high temperature and rapid operation, we can produce alloys of new and wide commercial application, alloys of high tensile strength or of extreme hardness, or of special magnetic properties, or of decided corrosion-resistant characteristics.

Paralleling the rapid growth of the electric steel industry is the growth of the ferro-alloy industry—ferro-chromium, ferro-manganese, ferro-silicon, ferro-silico-zirconium, ferro-vanadium, ferro-molybdenum and others. All of these alloys are used primarily in the steel industry, but the modern alloy steel industry could not

exist without another important electric furnace industry, the abrasive industry—silicon carbide and corundum. Many of the new steels must be cut and finished with these electric abrasives. Every pound of carborundum consumes 3.5 kw.-hr. during its manufacture. A new electric corundum plant was recently completed at Niagara Falls, Ont., and another new one in England.

Outlook for the Future—Our research laboratories are continually adding to the already pretentious list of products of the electric furnace and electrolytic cell. What may we expect in another ten years? How will these electrochemical products affect basic industries? Indications of radical changes are already evident. Railroads will completely modify design and structure of their equipment, speeds of 100 m.p.h. will be common. Our new transatlantic steamers will profit by the experience of the high-speed motor boats and airplanes, and the airplanes, too, will be much lighter in weight and operate at higher speeds. Our buildings will no longer be encumbered with heavy walls and floors, but glass and metal will predominate.

And as to future electric power consumption for electrochemical industries, we can safely predict that in another ten years it will be twice that which it was at the peak, in 1929; it will be at least 30,000,000,000 kw.-hr. per annum, or about one-third the total power generated in the United States today.

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Bangor Spends to Save

By purchasing a 5,000-kva. General Electric synchronous condenser the Bangor Hydro-Electric Company has taken steps to solve a major problem in voltage regulation in the Bangor area, postpone the construction of a tie line which would cost about $150,000 and increase the utilization of existing system generating capacity by from 1,200 to 1,500 kw., depending on hydraulic conditions. President E. M. Graham informs the ELECTRICAL WORLD that the condenser installation will cost between $35,000 and $40,000, or no more than a 1,000-kva. hydroelectric unit which might have been installed at the Veazie station as an alternative solution. The condenser will permit the operation of the Veazie generators at unity power factor instead of 80 per cent as at present. Under present conditions it is necessary arbitrarily to limit the output of the Veazie waterwheels in order to keep the current in the generator windings within safe limits, as the wattless current inherent in the local load reduces the capacity of the generators below that of their prime movers.

The Veazie station serves as a generating source, interconnection point for transmission lines from other plants and a load center for Bangor. Increasing loads in the district demand more than Veazie's capacity alone. Under peak load and emergency conditions the transfer over one tie line exceeds the capacity of the circuit and adversely affects voltage regulation in other areas, with unstable tendencies. Reconstruction of the overloaded tie line would cost four or five times as much as the condenser. The installation of load ratio control equipment would have compensated for the excessive voltage drop on the tie line without producing further benefits, but owing to the non-standard voltages involved the equipment would have a short economic life and would cost at least as much as the condenser. The new equipment will reduce the burden on exciters and voltage regulators in several generating stations and, besides improving stability, will increase the ability of Veazie to clear short circuits with speed and precision. The installation is to be completed this spring.

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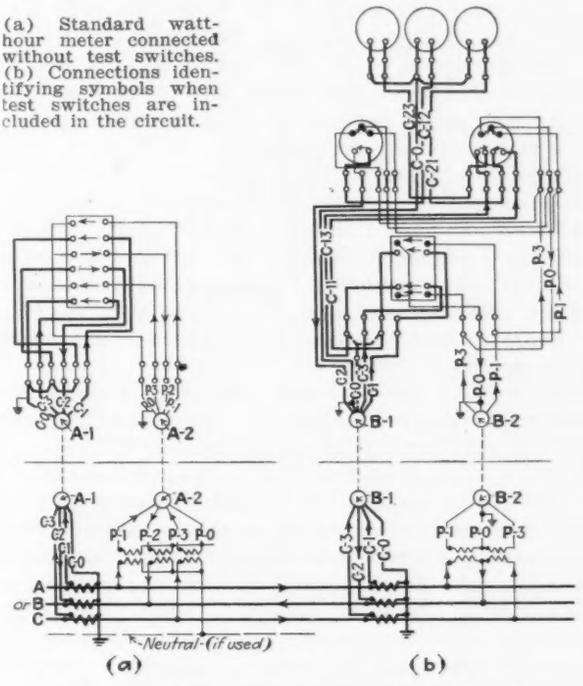
Color Code for Meter Leads Simplifies Testing

By J. P. SURRATT

Salt River Valley Water Users' Association

Some form of standardization is desirable in meter and instrument connections to insure correct readings or operation and facilitate changes and replacements. A simple yet complete system of identifying leads to such apparatus used by the Salt River Valley Water Users'

(a) Standard watt-hour meter connected without test switches. (b) Connections identifying symbols when test switches are included in the circuit.



Meter and instrument connections coded in accordance with practice of Salt River Valley Water Users' Association

Association, both on the customers' premises and in its own plants, has proved to be most practical.

In the accompanying diagram primary conductors are arbitrarily designated as *A, B* and *C,* if they are not already marked. Secondary current transformer leads are designated as *C*-1, *C*-2, *C*-3 *and C*-0, respectively, with potential leads bearing the notations *P*–1, *P*–2, *P*–3 and *P*-0. Common connections are always identified as either *P*-0 or *C*-0, are grounded both at the instrument transformer and at the switchboard, and separate wires are used for the current and potential transformer grounds to simplify testing and eliminate error. When test switches are installed current leads beyond each test switch and its instruments have their original numbers

increased by ten, thus: *C*–1 becomes *C*–11, *C*–21, *C*–31, etc., in turn.

By code requirements, the grounded side of a lighting circuit must be a white wire. Thus *C*–0 and *P*–0 are identified by this color and the other current and transformer leads are similarly identified by any other colors that may be selected. *C*–1 and *P*–1 may be red, *C*–2 and *P*–2 black and *C*–3 and *P*–3 blue. By using different-sized wire for current (No. 12) and potential (No. 14) circuits this color scheme automatically becomes self-identifying.

Each conduit is given a symbol that identifies the primary circuit with which it is associated and is numbered also according to the kinds of leads it contains. A suggested nomenclature is No. 1 for current leads, No. 2 for potential circuits and No. 3 for circuit breaker control.

Complete nomenclature of circuits in the manner prescribed above results in a neat, systematic installation that aids in tracing circuits as well as insuring accuracy in readings and periodic testing. Standardization of such circuits inside and out of the company has aided the meter personnel and saved time in routine testing and checking.

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Cutting Cost of Inspection and Maintenance

UNDER the economic stress of the last 1⅔ years many systems have availed themselves of the successful inspection and maintenance experience of previous years* to lengthen the inspection periods, all toward the end of lowering the maintenance costs. Another tabulation of 24 companies' practices has been made† in the belief that some have progressed even further with safety because of (1) greater knowledge of the performance of the equipment, (2) better testing facilities, (3) higher maintenance practices furthered by more conscientious workmen, (4) gradual fading into a dim background the failures of former years, which in turn caused a standard practice to be adopted now unwarranted in the present-day searching analysis of every problem, and (5) more stringent service requirements or the desire to avoid possible interruptions when making the inspections.

Past experience has indicated that the frequency of inspections or maintenance can be cut down in some cases without hazarding service.

Comments of H. S. Fitch, chairman of the subject committee,† which presented the latest practices, tabulated herewith, serve to interpret their significance.

I. *Oil Circuit Breakers*—1. The plan of inspection of breakers on the basis of the number of trip-outs or of a cumulative duty score seems slowly to be growing in favor as nine systems now follow this practice in their substations and eleven systems in their transmission and power stations, compared with six systems in each class of stations in the last report. One member writes: "For the past several years we worked constantly to swing all maintenance and inspection to the cumulative duty basis. So far this has worked out very well."

Another member of a large metropolitan system states:

> Our practice may be changed in the near future. For instance, it is our present practice to overhaul the operating mechanisms and examine all breaker contacts of switches operating at 12 kv. or less, once a year.
>
> We are becoming doubtful whether this is justified, particularly in respect to the operating mechanisms, and are inclining to the belief that such complete overhauling work is justified only upon the indication of trouble, or possibly on a usage basis.
>
> A generator breaker that is operated once or twice a day the year around would naturally merit more frequent overhauling than a bus section switch or a line switch that may be operated only six or eight times a year.
>
> The time between inspections and cleanings of bus and breakers both indoor and outdoor was doubled about four years ago and the results seem to indicate that it can be doubled again.

Another company reports that the adoption of this cumulative duty score plan of inspection reduced costs of breaker maintenance the first year $15,000 and the second and third years $10,000 each year. The reduction in savings of the second and third years was due to the establishing of a limit of 2½ years between inspections for any and all breakers.

Limitations established by companies using this plan generally vary from semi-annually in the case of the power stations to 2½ years.

2. Since the last report there has been a decided swing toward *monthly* operation of breakers to determine if they and their control circuits function properly. The former almost equal preference for weekly tests has practically disappeared. One company uses a different relay for each periodic operation.

3. Testing the speed of operation of breakers (timing of breakers) only *when the operation of the breaker is questionable* is now favored by half the reporting companies; quite a trend in this direction.

4. Megger testing and testing by the power-factor method of oil circuit breaker bushings seems to have made little if any progress among reporting companies since the last report. Whereas five out of nineteen reporting companies did not use the megger test two years ago, seven out of the 21 do not do so now. Three companies now report testing by the power-factor method annually and one company has made two system tests.

II. *Relays*—Opinion is still about equally divided between testing relays *semi-annually* and *annually*.

III. *Transformers*—More and more the reporting companies favor *not* opening transformers for inspection excepting on evidence of bad conditions; 19 out of 24 companies now leave the transformers alone when external tests or indications fail to reveal defects.

IV. *Oil*—The interval between oil sampling of high-voltage breakers and transformers has increased in favor from *quarterly to semi-annually* with *annual* tests favored by almost as many companies.

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* *N.E.L.A. Bulletin, October, 1931.*

† *N.E.L.A. operating practice subcommittee of electrical apparatus committee.*

V. *Rotating Machinery*—Very little change from the *annual* inspection of this class of equipment is reported. Age of machinery, overloads, hours of operation, dirt conditions, all seem to be the natural correct factors to be applied to this problem and not a specific time interval. One company meggers the power station generators after each shutdown.

VI. *Induction Regulators*—Little change is noticed in the time interval between thorough inspection of equipment and motors, with the *monthly* period most favored.

VII. *Electrolytic Arresters*—Of those systems having in operation this class of equipment more are coming to favor inspection on condition of charging arc or measurement of charging amperes. One company has set a limit of 0.75 amp. on 132-kv. arresters.

VIII. *Automatic Non-Attended Distribution Substations*—Apparently conditions of service, importance of substations, presence of rotating machinery are factors which govern the interval between inspections by a qualified inspector.

Savings in Industrial Installations*

"A plant had a boiler to supply steam for heating glue and acid. The glue and acid containers were equipped with electric immersion heaters and the boilers shut down with a net saving of $175 a month.

"One establishment was using 77,000 lb. of steam a day, far disproportionate to the work being done. Investigation showed a faulty steam-driven pump. An electrically driven pump was used which caused consumption to drop to 32,400 lb. daily.

"Another manufacturer using three small electric furnaces wanted them up to temperature when his men arrived in the morning and consequently kept them on full heat all night. Installation of a time switch started the furnaces at the proper time, saving 15 per cent of the total power bill."

**From the power sales files of the Cleveland Electric Illuminating Company, cited by W. E. Benninghoff to Electrical Maintenance Engineers' Association at Electrical League of Cleveland.*

Inspection Schedules of 24 Operating Companies

I **Oil Circuit Breakers** (24 Companies Reporting)

1. Complete overhaul and inspection is made of the breaker, even though the breaker may not have been subjected to heavy duty, may not have thrown oil and the oil of which may not have tested below standard.

	Sub-stations	Power and Transformer Stations
Biennially	4	1
Eighteen months	1	..
Annually	7	9
Semi-annually	3	3
3-12 trip-outs	3	5
Cumulative duty score	6	6

2. Breakers are operated periodically to determine if they are mechanically operative and that the control circuits and mechanisms will function, where possible without interruption to service.

	Sub-stations	Power and Transformer Stations
Annually	1	..
Semi-annually	2	2
Quarterly	1	1
Bi-monthly	2	2
Monthly	13	9
Bi-weekly	1	2
Weekly	1	3
No regular schedule	1	1
Not at all	2	2

3. Tests are made to determine the speed of operation of oil circuit breakers (timing of breakers)

	Sub-stations	Power and Transformer Stations
Biennially	2	1
Annually	4	6
Semi-annually	3	3
At initial installation only	3	2
Operation questioned	10	11

4. Oil circuit breaker bushings are tested by meggering or by power factor test.

	Megger Test	Power Factor Test
Eighteen months	1	..
Annually	5	3
Semi-annually	6	..
Have made two tests	..	1
Have made one test	1	2
No regular schedule	1	..
Not at all	7	9

II **Relays** (24 Companies Reporting)

Relays are completely tested and inspected, including the control circuits.

	Sub-stations	Power and Transformer Stations
Annually	10	9
Semi-annually	9	9
Every four months	1	2
Quarterly	..	1
Monthly	1	1
Only when found faulty or when changing settings	3	2

III **Transformers,** (24 Companies Reporting)

Transformers are opened for inspection for loose connections, sludging of oil, obstruction to oil ducts, rust under cover, dirt on terminal board, etc.

	Sub-stations	Power and Transformer Stations
Triennially	..	1
Biennially	1	..
Annually	2	5
Semi-annually	2	..
Upon evidence of bad conditions	19	18

IV **Oil** (25 Companies Reporting)

The interval between oil sampling of high-voltage breakers and transformers is:

	Breakers	Transformers
Annually	7	6
Semi-annually	8	9
Quarterly	6	5
Monthly	3	5

V **Rotating Machinery** (24 Companies Reporting)

1. The inspection, testing and overhauling of rotary converters, motor-generator sets and condensers in substations and of generators in power stations is made:

	Sub-stations	Power Stations
Biennially	1	..
Annually	14	15
Semi-annually	1	..
Quarterly	3	2
Service hours	..	2
No regular schedule	1	2

2. Megger tests are made:

	Sub-stations	Power Stations
Annually	6	4
Semi-annually	4	..
Quarterly	2	3
Monthly	1	6
Semi-monthly	..	1
After repairs	8	7
Every time generator is shut down	..	1
Not at all	3	1

VI **Induction Regulators** (23 Companies Reporting)

Control equipment and motors are thoroughly inspected — in addition to the normal tests performed by the operator on each shift.

Biennially	1
Annually	2
Semi-annually	3
Quarterly	5
Monthly	7
When regulation is questioned	1
Not at all	4

VII **Electrolytic Arresters** (17 Companies Reporting)

Electrolytic arresters are detanked and inspected

Triennially	4
Biennially	4
Annually	2
On condition of charging arc	7

VIII **Automatic Non-Attended Distribution Substations** (22 Companies Reporting)

These substations are visited and inspected by a qualified inspector.

Quarterly	1
Monthly	3
Bi-weekly	1
Weekly	7
Twice a week	2
Every two days	1
Daily	7

British Have Compounding Transformer

Self-compounding of distribution transformers in ratings customarily used for rural service has been effected, according to a paper by J. Harcourt Williams appearing in the February *Journal* of the Institution of Electrical Engineers. It is effective in giving a 2-volt rise instead of the normal 3 per cent drop on loads of 95 per cent or better power factor. This calls for the motor loading being restricted to not more than half the combined lighting, cooking and heating load.

A pressure controller, so called, has two reactances connected between one of the terminals and a tap of the transformer secondary, the midpoint between the reactances constituting the outgoing terminal of the secondary circuit. The reactances serve as a potential divider at no load to give the desired secondary voltage. The end reactor has a closed iron circuit which is practically saturated, while the other has an air gap. Under load of approximately unity power factor the potential of the midpoint is shifted toward that of the end of the transformer winding, thus raising the distribution voltage with increased loading.

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READERS' FORUM

Happy Valley More than a Dream

To the Editor of the ELECTRICAL WORLD:

In connection with the news article and editorial on the widely proclaimed Tennessee Valley development appearing in the February 11 issue of ELECTRICAL WORLD permit me to make the following comments:

To the average reader it matters little whether a drainage area of 40,600 square miles is given by the daily press as 640,000 square miles or if other similar distortions are published. But it is with a feeling of regret and dismay that the engineer notes similarly distorted figures in the particular technical journal which he has come to regard as a medium of reliable information. In the news item the statement appears that:

"2,000,000 to 3,000,000 hp. can be produced at Muscle Shoals, where the federal government has already spent $165,000,000 . . ." Also it is stated that "the Tennessee River basin has an area of 640,000 square miles." Also "he foresaw an ultimate power development costing $1,200,000,000 to produce 3,000,000,000 kw.-hr. a year at a cost of 4⅓ mills."

The final quotation is obviously in error; assuming annual charges of approximately 10 per cent, it can readily be deduced that 30,000,000,000 kw.-hr. is meant. As against all the above purported data let me cite figures from the progress report of the chief of engineers on the Tennessee River and tributaries submitted to Congress by the Secretary of War, February 25, 1928:

Dam No. 2 (Muscle Shoals) has installed at present 184,000 kw. Its power house will permit the installation of ten additional units, which will bring its installed capacity up to 450,000 kw. When the entire system is developed the installation required for a 50 per cent load factor would be 672,000 kw., of which 530,250 kw. would be hydro and 141,750 kw. would be steam. The drainage area of the Tennessee River is given as 40,600 square miles.

When the entire system of possible navigation, water power and flood control is developed it will be possible, if the market is available, to produce economically an output of 25,640,000,000 kw.-hr., of which 22,600,000,000 kw.-hr. would be hydro-electric power and 2,940,000,000 kw.-hr. would be steam, requiring at 50 per cent load factor 4,777,800 kw. hydro-electric installation and 1,077,800 kw. steam installation. The total cost of the navigation, water and flood control projects would be over $1,000,000,000.

I cannot agree with your editorial. The Happy Valley is not a land of dreams. Even prior to 1928 private interests filed many applications for power project permits; in many instances there were several applicants for the same project. Eliminating duplications, the total proposed installations amounted to approximately 1,044,000 kw. Millions of dollars have been invested in rayon plants, Aluminum Company of America has established large plants, two companies alone have a smelting capacity of 24,000,000 lb. of copper a year. Zinc crushing, copper refining, fertilizer manufacturing, metal and wood working plants and knitting mills have spread over the valley. Large increases in population have been made in the last ten years by some of the cities of the area.

The Tennessee River and other similar projects are real. With government sponsorship they are immediately possible. They would provide, at the very outset, employment for many technical men, an early increase in business for the electrical equipment industry and, later, work for construction and operating men of all classes. Without government sponsorship I doubt very much if sufficient capital can be secured for a long time to come for the promotion of this work by private interests.

FRANK A. RENNER.

Lehighton, Pa.

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Contends Utilities Should Take Initiative

To the Editor of the ELECTRICAL WORLD:

I have read the article on page 67 of the January 14 issue of ELECTRICAL WORLD with interest, but inasmuch as the demands of the average industrial plant in many cases developed with considerable swiftness in times of increasing business it would seem that the time element would not be sufficient for a proper working out of the proposed co-operative arrangements unless details were planned well in advance. Decisions to replace obsolete equipment may also develop rather rapidly in industrial plants once undesirable safety features are demonstrated.

Inasmuch as the economics on the utility side are usually more complicated than on the industrial, very little will probably be done unless the large utilities take the initiative and figure out well in advance of periods of sharp business increase the future possibilities of desirable co-operative arrangements.

Regarding several investigations with which I have been personally familiar, it has been found that where a reasonably good industrial steam-electric balance existed replacements or additions could not be justified merely for the purpose of increasing surplus power sales. This finding could readily be changed by improvements in power-producing equipment or reduction in installation costs.

J. H. CATHER,
Assistant Superintendent Power.

Eastman Kodak Company,
Rochester, N. Y.

Men of the Industry

DR. IRVING LANGMUIR, associate director of the research laboratory of the General Electric Company at Schenectady, N. Y., who received the Nobel prize for outstanding achievements in chemistry in 1932, returned to this country last week on the Italian liner *Rex*.

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HENRY L. DOHERTY was the guest of honor at a testimonial dinner held March 10 at Miami, Fla., which was attended by hundreds from all parts of the country. Tribute was paid to Mr. Doherty in an elaborate program of celebration of All-Florida Doherty Day for the civic work he has done in making that state a leading winter resort.

•

F. W. PEEK, JR., chief engineer Pittsfield Works, General Electric Company, has been appointed representative of the United States National Committee of the International Electrotechnical Commission on an international subcommittee of the advisory committees on rating of electric machinery and standard voltages and codes. This subcommittee is to make a detailed study of the proposals which have been made by the various countries on the question of sphere-gap calibrations.

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THOMAS W. OZLIN, formerly Speaker of the House of Delegates of the Virginia General Assembly and for years prominent in public life in Virginia, will succeed George C. Peery as a member of the Virginia State Corporation Commission, when Mr. Peery resigns to begin his campaign for Governor of Virginia, according to an announcement by Gov. John G. Pollard.

•

J. M. HIPPLE has been appointed general manager of merchandising engineering of the Westinghouse Electric & Manufacturing Company. In this position Mr. Hipple will have charge of the appliance, motored appliance and refrigeration engineering departments and, in addition, the radio engineering at Chicopee Falls works, the small motor engineering at East Springfield works and the industrial heating engineering at the Mansfield works have been added to his responsibilities. Mr. Hipple has been identified with the Westinghouse organization since his graduation from Ohio State University in 1898.

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STANLEY A. DENNIS has joined the staff of the National Electrical Contractors' Association as field representative, with headquarters for the present in Chicago. Because of his long association with the electrical industry and his understanding of the electrical contractors' problems Mr. Dennis is well qualified to represent the association. During the past fifteen years he has been connected with the electrical trade press, including *Electrical Merchandising, Electrical Retailing, Electrical Record, Electrical Manufacturing* and as an officer of the Gage Publishing Company. He has been active in the National Electrical Contractors' Association for a number of years and from 1924 to 1931 was a member of the board of governors of the Electrical Board of Trade and the Electrical Association of New York City.

OBITUARY

COL. GEORGE W. WATTS, a pioneer in Canadian electrical development, died suddenly March 1, from a heart attack, in his seventy-first year. He was one of ten men who organized the Canadian General Electric Company, from which he retired as works manager three years ago, after a connection of 40 years.

•

R. M. STANLEY, electrical engineer Byllesby Engineering & Management Corporation, died March 7, at his home in Western Springs, Ill. Mr. Stanley had been associated with the Byllesby organization since 1910, having formerly served in an engineering capacity with Sargent & Lundy and the Corn Products Company. He was graduated from Cornell University as an electrical engineer in 1898. Mr. Stanley was active in the American Institute of Electrical Engineers and the National Electric Light Association for many years. He was 57 years old.

•

NELSON L. POLLARD, consulting electrical engineer, who was associated with the United Engineers & Constructors, Inc., Newark, N. J., died March 3, after a long illness, at his home in Elizabeth. He was 65 years of age. Mr. Pollard was a native of Nebraska and a graduate of the University of Nebraska. He was a fellow of the American Institute of Electrical Engineers and a member of other professional associations.

•

WILLIAM A. ROSSELL, assistant Northeastern district manager of the Westinghouse Electric & Manufacturing Company, died suddenly, March 8, at his home in Summit, N. J. Mr. Rossell had been associated with the Westinghouse organization for 32 years and was considered an authority on the generation and distribution of power. Born in Rahway, N. J., 52 years ago, Mr. Rossell had lived in the metropolitan district for the better part of his life. He became identified with the Westinghouse company following graduation from high school and in the course of his association with that organization held many executive positions.

•

E. CHESNEY HAYWARD, pioneer in the electrical industry in Victoria, B. C., and partner in Hawkins & Hayward, electrical contractors, died recently, of a heart attack, in his fifty-eighth year. Following graduation from Leland Stanford University with the degrees of M.A., B.A. and B.Sc. in electrical engineering he engaged in academic work at that institution and at Oregon State College until 1905. He then returned to Victoria and, with Mr. Hawkins, organized the business of which he remained a partner up to the time of his death.

•

LEOPOLD STARK, a leading Hungarian electrical engineer and vice-president of the Electrotechnical Association of Hungary, died recently, in Budapest, at the age of 66. Mr. Stark was for many years connected with Ganz & Company and was a joint worker with the late G. Herzog in drawing up the Herzog-Stark method of calculating the laying out of electric power distribution systems.

•

C. J. ZEIGLER, southeastern district manager of the Simplex Wire & Cable Company of Boston, was fatally injured January 12 when he was struck by a flying block of wood from a power saw near his district headquarters in St. Augustine, Fla. Mr. Zeigler became service engineer for Simplex, with headquarters in Jacksonville, in 1925, five years later being appointed to the position he occupied at the time of his death. Early in his career he spent several years in the steel mills and with power companies in Pennsylvania and with the General Electric Company at Pittsfield, Mass. It was while en route to Mexico to investigate a promising offer with the General Electric Company of Mexico that in 1909 he stopped by chance in St. Augustine and became interested in the proposed electrical work of the overseas railway to Key West. He remained seventeen years with the Florida East Coast Railway as chief electrician and in this connection was electrical consultant for the other Flagler interests—the hotels system, the car-ferry from Key West to Havana, the Model Land Company and the Miami Electric Light Company, as well as consultant for various power companies on the east coast of Florida. Mr. Zeigler was 49 years of age.

New Equipment Available

Improved Capacitor Motor

Improved capacitor motors for refrigerator applications have been announced by the General Electric Company. This motor has many features which tend to make it outstanding, among them drip-proof end flanges, simplified connections, a smaller capacitor case and a larger oil capacity.

New end flanges prevent any foreign material from dropping into the motor. A new terminal box, designed primarily for convenience in making connections, is cast in one end flange. On the terminal board in this box are three terminals, two of which are connected to the motor leads. The third terminal is a dummy, provided for easy connection of the cold-control leads.

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Penetrating Protective and Decorative Material

A protective coating which can be applied to damp or rust-pocked surfaces, indoors or out, and which primes, protects and decorates in one operation is announced by the Quigley Company, New York, after two years' field trial. Outstanding features are penetrating and corrosion-preventing qualities, the coal-tar-naphtha base penetrating, not merely bridging, rust, pores and crevices, while aluminum flakes mixed with it just before using immediately come to the surface, providing a decorative surface of great durability. The material dries by evaporation, not oxidation. Among other qualities claimed for it are stability of protective qualities after long exposure to acids, alkalies and moisture, excellent heat-resisting qualities, ability to withstand temperature changes, vibration and reasonable bending without chipping or peeling. This product, which may be brushed or sprayed, is designated as Triple A-44 aluminum vehicle.

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Improved Fuse Clamps

Addition of "Vystipe" fuse clamps to its 30-amp., 230-volt fusible "RB" switches, which now makes the entire line of "RB" switches available with Vystipe clamps 30 to 800 amp. inclusive, has been announced by the Trumbull Electric Manufacturing Company, Plainville, Conn.

Thorough tests have shown that this pressure type of clamp, by compelling proper fuse alignment and contact, permanently reduces heating 80 per cent over properly contacted ordinary ferrule fuse clamps 30 to 60 amp. and an average of 28 per cent over properly contacted knifeblade fuse terminals 100 to 800 amp., thereby preventing premature blowing of fuses.

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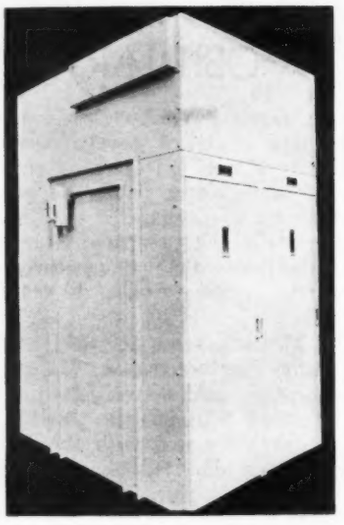
Steel Inclosures With Eye Appeal

Straight clean-cut lines free from offsets, projections and open spaces difficult to keep clean characterize the latest developments in steel inclosure for substation equipment. A new line of steel units with doors lacking visible



hinges, bolts and nuts and with heavy cast-aluminum handles has been brought out by Delta Star Electric Company. Early installations have been made at Vernon, Calif. Any desired color or color combinations are available to match finishes or building trims.

The only projections are at the end of the structure, where provision is made to extend buses and add future units. The removable cover is attached at this point and when extensions are made the cover is moved along to the newer unit. The oil circuit breaker gas relief header with its gage is attached to a reinforced steel frame which, when extensions are made, is also moved to the new end unit. Thus only projections are in the end unit, keeping the front and rear of the switchgear entirely free.

▼

CEILING PROJECTOR for determining the height of clouds at airports and weather bureau stations has been perfected by the Westinghouse Electric & Manufacturing Company. It is made of cast aluminum supported by a heavy steel bow and has a beam candlepower of more than 3,000,000 using a 240-watt lamp.

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Simple Electrical Temperature Indicator

In many industrial processes better results can be obtained if the operator can read at one central regulating point the temperatures existing at various remote points. For such applications a new temperature indicator of the electrical type, known as the "Electrotemp," has been announced by the Westinghouse Electric & Manufacturing Company. The Wheatstone bridge principle of operation is used, with a sensitive search coil located at each of the points where the temperatures are to be measured. Voltage is supplied to the Wheatstone bridge from 110-volt, 60-cycle alternating-current outlet, thus no direct current or battery supply is necessary as is usually the case with this type of temperature indicator.

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SURGE ABSORBERS of the Ferranti type are now manufactured in the United States in three styles. As offered by Ferranti, Inc., the "DO" absorber, oil-filled and of the disk coil type, is for 33-kv. lines or less; the "CC" unit is used for relatively low voltages and is composed of cylindrical coils compound filled; the "H" unit is of the oil-filled type and is suitable for high-voltage service.

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TRIPOMATIC FUSE CUTOUTS incorporating features of design entirely new in the fuse cutout field are announced by the James R. Kearney Corporation, St. Louis, Mo. The cartridge and door assembly is automatically released when the fuse blows, leaving the circuit entirely open. This feature serves two purposes: First, the removal of the fuse cartridge from the circuit so that leakage currents or carbonization of the fuse tube cannot occur; secondly, it serves as a telltale by which the blown fuse can be located from the trouble-man's car.

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PRACTICAL LIQUID PORCELAIN CEMENT available in three consistencies, a cement paste for application with trowel or similar tool, a dipping cement suitable for dipping, spraying or brushing and a dry powder ready to be mixed with water to the desired consistency, is announced by Henry L. Crowley & Company, West Orange, N. J. Setting in a short time without application of heat, this cement is proof against oil, acids, gases and heat up to 2,000 deg. F., it is claimed.